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Chemical Engineering in Industry

THERE was a jovial song extant in college days which ran something like this:

> Chemical engineering
> Includes most any old thing
> That brings the mon. . . .

The rest of it is forgotten, but that much of it was a rather humorous truth. Chemical engineering did include most any old thing and most any old body. A laboratory man would begin factory work and win two things on his first day; one was a pair of greasy hands and the other was the title of chemical engineer.

During the past two decades the field of chemical engineering has become infinitely more extensive, but at the same time very much more definite. Originally it was the engineering side of chemical manufacturing, but it began to spread to industries that did not manufacture chemicals in the strict sense of the word. Only within recent years has this development become crystallized and understandable. It has not been an expansion that has been brought about by the wider recognition and employment of a definite type of technically trained man. In other words, chemists and chemical engineers have not been entirely responsible for the growth of chemical engineering. This can be proved to the doubting Thomases by pointing to industries where chemists and chemical engineers are still unknown, but where chemical engineering developments have been carried out by metallurgists, mechanical engineers or by production men with no technical background. These men are in reality chemical engineers, because they are doing work that chemical engineers do. It is work that deals with the problems of production in all industries that use chemical engineering processes. That is a definition in terms of itself, but it brings us to the foundation and basis of it all. Chemical engineering processes! Once we understand this term, the others, chemical engineering industries, chemical engineering and chemical engineer, are defined at least in matrix.

What are chemical engineering processes? Crushing and grinding; mixing and kneading; mechanical separation; filtration; centrifugal separation; hydraulic pressing; evaporation; distillation; drying; gaseous, liquid and solid phase reactions; roasting and calcining, etc.

Advance has been made largely through a study of these units out of which all manufacturing processes in the chemical engineering industries are constructed. Progress is not conjured up by saying, "Come, let us make improvements in the manufacture of this product," be it fertilizer, cement, insecticide or alkali. But it is the result of an improved filtering equipment, a better fractionating column, a more uniform mixing or agitating, an instrument better adapted for measuring temperature or pressure. These are the substantial steps to increased production, lower costs and improved products. Each represents an investigation of a unit in the process and hence the term now in such wide use—the unit processes of chemical engineering.

With this as a background, *Chem. & Met.'s* Exposition Issue this year will be devoted to unit processes. It is an effort to drive home to production men in the chemical engineering industries the fundamental importance of unit processes. Advances in the technology of any unit process affects a dozen industries. The Exposition Issue is a forerunner and an earnest of the service that *Chem. & Met.* pledges on these basic units of chemical engineering.

Why Not 100 Per Cent?

REPORTS emanating from United States Tariff Commission would seem to indicate that the American dye and synthetic organic chemical industries are now supplying well over 90 per cent of our requirements. As the matter now stands any product for which there is a real tonnage demand can be supplied of first quality with deliveries that are sufficiently prompt to satisfy every reasonable need. At the other end of the scale of quantities, the laboratories of certain colleges and research institutions, the Eastman Kodak Co. and a few other enterprising chemical firms have insured the supply of a large number of research and special chemicals which otherwise would be unavailable. But between tonnage production and research laboratory requirements there still lies a partly unsatisfied market for organic chemical products that are really needed but for which the demand is only a few pounds up to a ton at the most.

A few special and newer types of dyes, along with certain pharmaceuticals, photographic chemicals and other organic specialties, are included among these commodities. To make them successfully would require something more than strictly laboratory operation, yet the demand would not be such as to justify full-scale production. The problem is, therefore, to find a means of supplying them at a minimum cost without disturbing the regularity of plant operation or imposing excessive demands on the laboratory. The importance of the commodities justifies careful consideration of an arrangement that would facilitate domestic production and bridge the last remaining gap to chemical independence.

A friend with whom we discussed this problem was of the opinion that the situation could best be met by a co-operative effort. He suggested the formation of a non-profit-making corporation which would be supported as to original investment by the organic chemical manufacturers of the country and which would act as a service agency to all. Although recognizing that there are strong arguments in favor of such a plan, we are of the opinion that this form of co-operation will not solve our problem. The industry's past experience with similar schemes can scarcely be regarded as satisfactory. Quasi-public ventures are commonly viewed with suspicion and are subject to constant attack by reformers and politicians. Furthermore there is the sharpest competition in our organic chemical industry, and it is certain that some manufacturers would resent any attempt to limit or dictate the fields of their endeavor.

A somewhat similar plan that suggests itself is to handle the matter through an existing trade association. Here again, however, there are the same objections that hold for any co-operative plan and we run counter to well-defined legal advice regarding proper trade association activities. The more natural arrangement would be for the association to encourage private enterprise. Many manufacturers are equipped with experimental or semi-commercial plants that fit them admirably for producing these needed chemicals. The fact is that certain chemical firms have already organized their development works as separate corporate units and are successfully carrying on small-scale chemical manufacturing. This plan is capable of being extended greatly and if properly encouraged we believe that it offers a practical solution to our problem.

Just now the American dye industry is not greatly embarrassed by its inability to supply every single commodity. The method of foreign competition formerly practiced under the popular designation "full-line forcing" is not at present feasible. But there still remains to the foreign producer some strategic advantage in being able to offer commodities which the American maker is not yet able to supply. Until the full variety of needs which are reasonable and genuine is met, the public will continue to ask why it is that we must go abroad for certain materials. Is not our domestic industry skilled enough to supply them? They may even suspect unwillingness to bear the responsibility of full production and assume that there is a spirit of profiteering in the industry.

It will be well worth while, therefore, for the industry to preclude every possibility of such criticism. Even if, in so doing, our manufacturers are compelled to write off a small percentage of their gross profits, they are performing a real public service and are making an excellent investment for the future of chemical industry in America.

Another Case of Political Persecution?

AS THE smoke clears away from the scene of the Chemical Foundation's recent battle, it is becoming increasingly apparent that the government's attack constituted one of the most flagrant cases of attempted political persecution in the history of the country. From the first it has been evident that politics prompted the desire to win this case—to discredit a former administration, and perhaps at the same time to win the German vote. So far the well-laid plans of the Department of Justice have all come to naught, but instead of being discouraged at this turn of affairs, the department again breaks forth with another long series of indictments against some of the former leaders of chemical industry.

A suit has been filed by the Attorney-General charging conspiracy and fraud in the sale of the Old Hickory Powder Plant to the Nashville Industrial Corporations of New Jersey and Tennessee. It is claimed that the plant with its 3,700 residential and manufacturing buildings and 5,000 acres cost the government $100,000,000 and was sold after the armistice for only $3,500,000. Ernest C. Morse, former director of sales in the War Department; Everly M. Davis, one-time president of the Federal Dyestuff Corporation; Alexander W. Phillips, and others were mentioned in the indictments. The successful bid, it is claimed by the government, while appearing to be the highest responsible offer, was in reality much below other bids and "the conduct of Ernest C. Morse in negotiating the contract was influenced by the prospect of employment by the defendant at a large and remunerative salary, and by reason of such prospect he unlawfully, fraudulently, counseled and advised making of such contract."

So much for the government's charges. On the surface it would seem that there is nothing in them that is particularly new or startling. The facts of the case have been well known to all who have watched the War Department struggle with its tremendous after-war problems. The great loss in liquidating this particular

munition plant may have been unavoidable. Certainly it was no exception to the many losses privately incurred at that time by our chemical industries. But to drag these facts out now, to rehearse them before a court and to have them garbled by a partisan press will accomplish nothing.

During the progress of the Chemical Foundation trial many persons withheld the expression of an opinion, thinking that in the presentation of its case the government would develop evidence not generally known to exist. When the trial finally revealed that this was not forthcoming and that the government's contentions were even weaker than those which had previously been advanced, these persons became outspoken in their surprise that the original action was brought. Among them it is the most general opinion that the government is doomed to lose its case. Naturally, now, these same persons want to know whether Old Hickory is to be a repetition of the Foundation fiasco. Can the government substantiate its charges or were they merely political fireworks? The public is beginning to lose patience with such disgraceful tactics and it is equally certain that the chemical industry will not long continue to submit without protest to this partisan political persecution.

Continuous Production In the Glass Industry

IN VIEWING for the first time the automatic drawing of a huge cylinder of window glass or the casting of a pot of plate glass, the spectacle of the operation is almost certain to overshadow the fact that in spite of most ingenious mechanism the process is still intermittent and therefore lacking in efficiency. Consideration of the subsequent operations—cutting and flattening of window glass; annealing, grinding and polishing of plate glass—serve only to emphasize this opinion.

Within the last few years continuous production methods have become firmly established in the window glass industry through the introduction of the sheet-drawing machine. In a plant of this type one is at once struck with the almost complete absence of the spectacular as well as the human element. From overhead storage bins the batch mixture is fed into a continuous tank furnace. At the far end of the long building a cold flat sheet of glass passes steadily from the leer to the cutting table. Two or three men at each strategic point—the feed end, the drawing mechanism and the cutting table—constitute the operating force. Indeed, a plant in full operation has an almost deserted appearance; there is no noise, no confusion, no evidence of activity.

Nor is the plate glass industry to escape the hands of progress. In many quarters intense effort has been directed toward the solution of its problem. But it seems quite fitting, at least to the general public, that Henry Ford should be among the first to operate on a production basis. Recently it was our privilege to view in succession a modern plate glass plant of the intermittent type, Ford's experimental continuous machine at Highland Park and the first unit of a huge plant at River Rouge. As in the case of window glass, the spectacular has been eliminated. The pots are gone; the great round grinding and polishing tables insistently reminiscent of some of the devices at Coney Island. these too are gone. Instead, glass flows continuously from an opening in the end of a tank furnace onto a slowly moving conveyor, where it forms a sheet of the proper thickness which passes in a straight line through the leer. Grinding and polishing have also been reduced to straight line operations. Although the present machines are designed only for comparatively narrow widths, suitable for windshields, it would seem that the principle is destined to revolutionize the plate glass industry.

It is a privilege to record here these proofs of the progressive spirit of the American glass industry.

The Pitfalls Of Overproduction

AFTER the petroleum industry had so successfully defended itself against the insidious propaganda of Senator LaFollette in his now famous report on "dollar gasoline," it is surprising to find the industry suffering from an injury at its own hands. Yet its own orgy of overproduction appears to be the underlying cause of the gasoline price war that is now sweeping the country. To be sure, the politicians are still in the picture, but their contribution is an indirect rather than a direct responsibility.

Stocks of crude oil in storage have recently mounted at an alarming rate until at the present time no less than 300,000,000 bbl. are on hand. Consumption, which in June was at the rate of 14,913,553 bbl., has been considerably less than production. Our stocks of refinery products are proportionately large. The Bureau of Mines has estimated that at the end of June we had 1,263,000,000 gal. of gasoline in storage, or 53 per cent more than the stocks of a year ago. These figures briefly set the stage for what happened last week in the Middle West. The financial interests that had helped the refiners—particularly the smaller producers—to carry the burden of their heavy stocks, gradually began to call in their loans. As a result many of the refiners were forced to dump their gasoline on the market at whatever price it would bring. These were the so-called "stress sales" which state and municipal authorities were quick to sieze upon and which immediately broke the refiner's market.

There can be little doubt that gasoline at 15 cents is selling at considerably less than production costs, particularly with crude oil at the high levels it has occupied during the past year. Naturally a drastic reduction in these prices is immediately imminent. That in itself, however, will scarcely deter this disastrous price war, which unless stopped by government intervention will likely continue until the present high-priced stocks are exhausted. How many of the oil companies will be able to weather the storm is an open question, but certainly those that do will make a determined effort to recoup their losses. And the well-known methods employed under such circumstances have proved remarkably successful in the past.

From the public's standpoint, therefore, little is to be gained from foolish price wars. Savings in today's gasoline bill will be balanced by higher costs tomorrow. Much the same is true from the industry's viewpoint. Some minor improvements in distribution may be effected, and a few inefficient production factors may be eliminated, but the gains are paid for dearly. The real lesson to the industry is to avoid the pitfalls of overproduction.

What Is the Industrial Significance of Concentrated Fertilizer?

Here Is a Problem That Hits Home to Everyone as an Individual and as an Industrialist

©Harris & Ewing.

Dr. Milton Whitney

Director of the Bureau of Soils, U. S. Department of Agriculture. A public servant whose vision has been for years a salutary influence in solving the problems of soil fertilization.

THE subject of concentrated fertilizers is a hardy perennial and it is likely to continue to be one. This is inevitably the case when a question has two sides to it that can never be reconciled. The two sides to concentrated fertilizer are on the one hand the economy to be made by shipping a smaller bulk of material and on the other hand the impossibility of obtaining a uniform distribution of fertilizer when the bulk is too small.

There is no doubt that if a farmer could obtain a fertilizer containing 60 per cent plant food, he would save a great deal of money by not having to pay the freight on the great bulk of mere material that goes to make up a 14 or 16 per cent fertilizer. This is a point of view that Dr. Milton Whitney of the Bureau of Soils has championed. When he began his missionary work years ago the subject could hardly gain him a foothold for serious discussion, but little by little it has engaged the attention of agriculturists and fertilizer producers and is now a subject for serious discussion everywhere. In addition there has been a definite increase in the strength of fertilizer materials. Elsewhere in this issue in an article by W. H. Ross on this subject it is pointed out that the mixtures recommended at recent conferences represent an increase of about 58 per cent in concentration over the average mixed fertilizer of a few years ago.

The article itself is a discussion of sources of concentrated food for plants and by its very nature indicates the ever-increasing importance of the subject.

At the convention of the National Fertilizer Association, President Ober told of the "high-analyses" conferences that have been held under its auspices among the fertilizer industry, the experiment stations and the agricultural colleges. These resulted in cutting the number of formulas to a dozen or so in a given state, vastly simplifying thereby manufacturing procedure. Mr. Ober, however, pointed out that there were many problems to be solved. Among these was the elimination of some raw materials that were available and satisfactory for less concentrated products and an increase in the consumption of the more concentrated raw materials. It is in throwing additional light on this phase of the problem that Dr. Ross' paper is of great significance.

The other side of the question, the difficulty of distributing concentrated fertilizer evenly over a field, is one that remains to be solved. It is not an immediate problem. There is no difficulty with the so-called "high-analysis" fertilizer of commerce today. But it is a problem for the future. The congestion of transportation will continue to increase and therefore the pressure to exclude inert material from fertilizer will likewise increase. We shall reach the critical point of concentration where, with present methods, satisfactory distribution of the fertilizer on the soil will be impossible. What then? Will it mean new methods of application such as perhaps spraying a suspension? Will it mean a local dilution of material? This problem is of importance to the farmer, to the fertilizer manufacturer, to the public and to the chemical engineering industries whose prosperity is so largely mutually dependent. It is a problem that deserves your intelligent attention.

Modern Technology of
Automobile Leather Production

As Carried Out in the Plant of the General Leather Co. Is Described in This Article — Production Costs Are Being Reduced by Means of a Process Which Eliminates the Tacking Operation in Drying Grains and Splits Before Coating

BY ALAN G. WIKOFF
Assistant Editor, *Chem. & Met.*

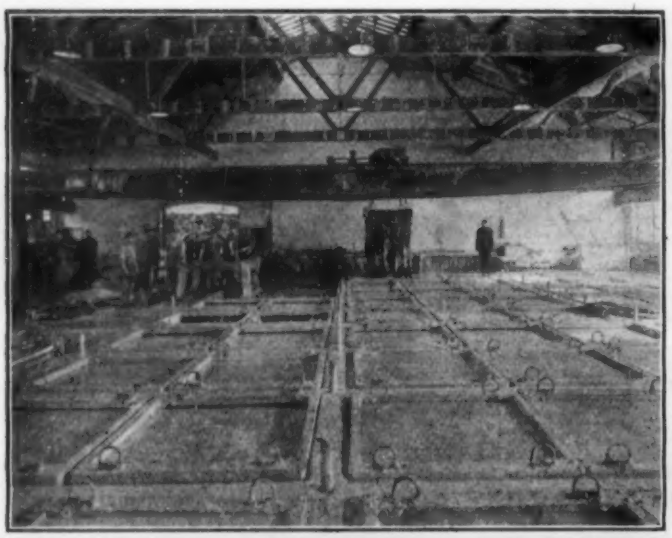
ALTHOUGH the production of coated or enameled split leather for upholstering purposes is by no means a new development in this country the rapid rise of this branch of the leather industry to its present important position has been coincident with and indeed largely the result of the astounding growth of the automobile industry. Old plants have been expanded and new ones built in order to keep pace with the demand for an upholstering material of pleasing appearance and good wearing qualities. Service conditions for this type of leather differ from those to which leather is usually subject, in that the leather itself is not required to resist surface wear, this being taken care of by the coating. However, the life of the coating depends not only upon the characteristics of its constituents and the method of application but also upon the properties of the base as well, and leather is an ideal base material.

As regards production technology, the plant of the General Leather Co., Newark, N. J., may be taken as representative of the most advanced modern practice, and it is the purpose of this article to consider the methods employed here. The plant is located in the southern part of Newark, not far from the Elizabeth line, extending from Frelinghuysen Ave. to the Pennsylvania Railroad, from which it is served by means of spurs. Brick buildings with steel-sash windows are used throughout so that excellent light is assured each department. The buildings are so arranged as to form two independent units, one having a capacity of 840 hides per day, the other 640, or a total of about 1,500 hides per day.

Splitting-room operations convert each hide into four pieces, three of which are worked up into finished leather, so that subsequent departments must handle about 4,500 pieces per day. Since the processes and equipment in the two units are practically identical, description will be confined to one in order to avoid repetiton.

Area being the marketing unit for this commodity, each process from the selection of the hides to the last finishing step is conducted with this point always in mind. The hides used are those known as spready steers, free of brands and measuring 6 ft. 8 in. and up across the brisket. They are obtained almost entirely from domestic packers. As received, they are placed in a light well-ventilated storage room adjacent to the beam house.

While the operations which constitute the preliminary wet work and tanning follow the line of general practice, the building construction and material-handling methods present a marked contrast to con-



Tanning and Splitting Form Preliminary Steps

Fig. 1—Lime Yard End of Beam House

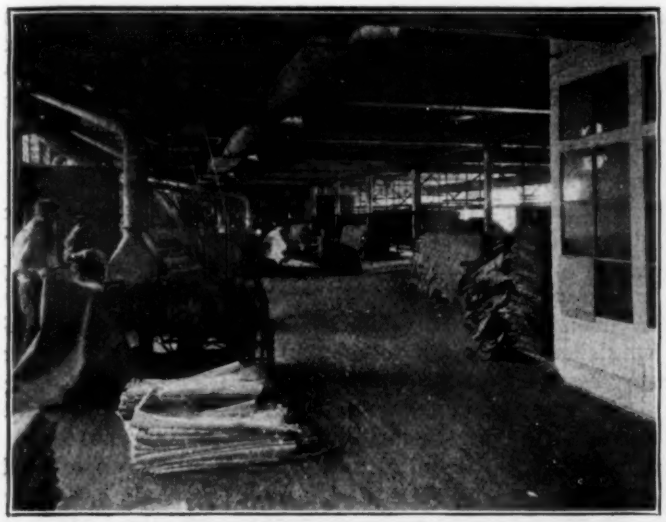
Fig. 2—Beam House

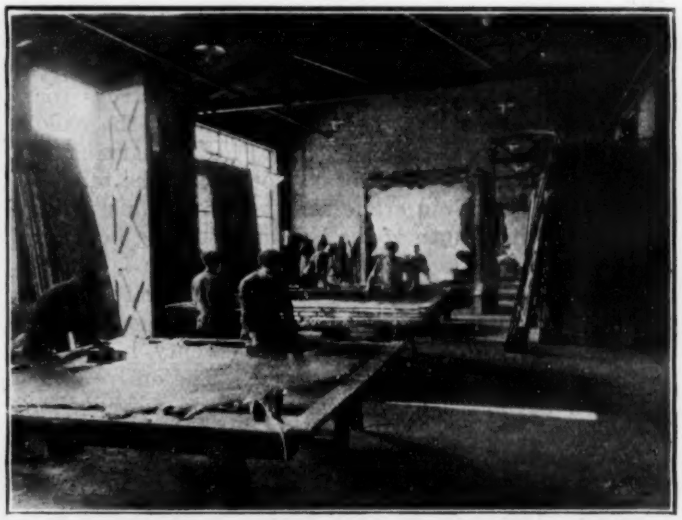
Fig. 3—Preparing for Splitting

Fig. 4—Where the Hides Are Split

Fig. 5—Re-tan Department

Fig. 6—Tacking and Drying Loft





Coating and Finishing Operations

Fig. 7—Shaving and Softening Department

Fig. 8—Finishing Hand Buff Leather

Fig. 9—Coating Splits

Fig. 10—Embossing

Fig. 11—Graining and Finish Softening

Fig. 12—Measuring, Packing and Shipping Room

ditions existing in many tanneries. The one-story brick building which forms the combined beam house and tanyard is amply lighted by steel-frame windows in the side walls and skylights in the wooden truss roof. Figs. 1 and 2 show the beam house section, the paddle wheels visible in the background, Fig. 2, marking the dividing line between the beam house and the tanyard. The electric traveling crane shown in both illustrations runs the entire length of the building, serving both lime pits and tanyard, so that a single operator is able to make all the changes required. The concrete pits in the beam house end are fitted with wooden frames provided with hooks so that about twenty hides may be hung vertically from each frame. The entire frame can then be picked up by the crane and moved about as desired. For the tanyard the frames are of somewhat different design, as the hides must be completely submerged and kept in constant motion to insure even tanning. One side of each frame is connected with rocker arms which impart an up-and-down motion to the frame. Because of this mechanism, this department is frequently referred to as the rocker yard. Here also the hides are suspended from hooks on two sides of the frame and the whole unit may be moved at will by the crane.

Preparing the Hides for Splitting

As required, hides are brought from the storage room (visible through the door in the back wall, Fig. 1), trimmed and soaked in water over night to loosen and soften adhering dirt. This is then removed on a brushing machine and the hides are hung on frames ready for liming. Starting with a mild lime solution, the hides progress for 6 or 7 days through solutions of increasing concentration until the hair has become sufficiently loosened. The lime in the pits is kept in suspension by plunging at intervals with a pipe connected with a compressed air line.

Unhairing and fleshing, which consists in cleaning the flesh side, take place in the machines shown on the right, Fig. 2. Traces of hair and flesh are removed by working over the beam by hand. Before proceeding to tan it is necessary to get rid of the lime that has been absorbed. This deliming is carried out in one of the sets of paddles shown in the background, Fig. 2. The action is assisted by the use of a patent bate and after 24 hours in the bating paddles all trace of lime has been removed. Washing for another period of 24 hours in clear water in the other set of paddles completes the preliminary wet work.

Since the hides are to be split subsequently, complete penetration is not required in the preliminary tanning. Accordingly the hides remain in the rockers for only about 7 days, starting in a weak liquor and moving every 24 hours to one more concentrated. Oak and quebracho extracts are the chief constituents of these liquors.

The surface-tanned hides are then prepared for splitting, the first operation being to pass them through press rolls, Fig. 3, which function as huge wringers, squeezing out surplus tan liquor and smoothing out wrinkles. After ragged edges have been trimmed off on the preparing tables, smoothing is carried a step farther on stoning jacks.

On the splitting machines, Fig. 4, rolls grip the hide as it is fed in by hand, grain side uppermost, and force it against a rapidly moving horizontal band-knife with an edge which is constantly maintained razor-sharp by emery wheels. The lower roll, which suports the hide, is segmental to allow for any irregularities in thickness so that the split may be perfectly uniform throughout. The machine may be set to produce a split of any desired thickness. These machines divide the hide into four pieces, the grain, two splits and the flesh side, which is known as a slab. At this plant slabs are not coated but are sold without further treatment.

Preliminary tanning having been inadequate for the production of good leather, the next step is to re-tan the pieces for about 7 days, vegetable tanning liquors being used for the grains, while the splits are put through a chrome re-tan in paddles as shown in Fig. 5. Oil emulsions are added to the tan liquors as the tanning progresses.

Oiling or stuffing is completed after the hides come from the tan by placing them on tables and thoroughly brushing in by hand a mixture containing fish oil and degras.

In order to obtain the maximum area, the leather is stretched and allowed to dry under tension. Fig. 6 shows a tacking and drying loft which was representative of best practice until very recently. With this system the hides are hung over a central wooden support and the lower edges are carefully tacked to adjustable side frames, which are then forced down so as to increase the tension of the leather. A great deal of skill is required to tack rapidly while stretching the hide and at the same time placing the tacks very near the edge so that the minimum amount of waste will result, for of course the edge with the tack holes must be cut away later. Fans for air circulation and steam coils for maintaining the required temperature during cold weather are also shown in Fig. 6.

Eliminating the Tacking Loft

As the result of years of study and experiment, this company has developed an ingenious process which promises to eliminate the troubles of the tacking room. Instead of conducting the stuffing operation on a table, the hide is hung over a large composition board which is then supported in an almost vertical position. A special mixture of oils is brushed on by hand and later worked in with steel slickers. When one side is treated the board is turned over in order to stuff the other side. Each move made by the operators is calculated to stretch the leather, and the final result is that the leather adheres to the surface of the board perfectly smooth and yet without the use of a single tack stretched to an extent not possible with the tacking frames. The saving is substantial, as there is an increase in area in addition to the 2 or 3 sq.ft. which is gained through the elimination of tack holes. After drying, the leather is simply stripped from the boards without the necessity of first removing hundreds of tacks as in the old method.

Naturally the leather in this stage is rather stiff, and after being sorted the grains are shaved in machines having reverse helical blades, Fig. 7, and passed through softening machines, which have two heavy rolls, one covered with rubber, the other with cork.

The splits are softened by revolving in drums for about 6 hours. Before going to the finishing department, surface defects, holes and tears are expertly patched.

Materials used in the preparation of the coating mixtures include boiled linseed oil, naphtha as thinner, pigments of various colors, nitrocellulose dopes and suitable solvents. In one corner of the plant is the boiling shed, where the linseed oil is boiled until it has the de-

sired body or consistency. The oil is then removed from the fire and thinned down with naphtha while still hot, the naphtha vaporized being recovered in a condenser.

Grains, being superior to splits, are finished into the highest grade stock, as for example patent leather, and thus receive somewhat different treatment from the splits. The grains are stretched upon frames as shown in Fig. 8, and a priming coat or daub of heavy-bodied boiled linseed oil is worked in with slickers by hand. The frames are then placed in steam-heated ovens for a day. This cycle of alternate coating and drying is then repeated five or six times until the desired finish has been developed. Patent leather and other finishes in which the final coating contains linseed oil require exposure to the direct rays of the sun in order to remove the final slight tackiness. In spite of extensive experiments, ultra-violet light has so far not proved satisfactory as a substitute. Accordingly, the frames must be placed out in the sun for several hours. In addition to the space shown in the headpiece, the company utilizes undeveloped property owned across Frelinghuysen Ave., so that a total of 2½ acres is available for sun drying.

Splits are not stretched on frames, but are placed on tables and daubed or coated as shown in Fig. 9. Between successive coats the splits are hung in steam-heated driers. In order that a coat may adhere better to the previous one, the splits are passed through small hydraulic presses, which emboss a slightly roughened surface. The finish coats for splits may consist of nitrocellulose dopes, applied by compressed air spray.

While splits, of course, lack a natural grain, it is possible to imitate any grain by pressing an engraved plate into the finished surface. Embossing presses, Fig. 10, produce a variety of grains on the different finishes. Some special finishes require quite elaborate treatment. Thus, in the case of the popular so-called Spanish leather, the surface is first embossed with the characteristic deep creases and a very thin dope containing a darker pigment than that used in the finish is then brushed on and wiped off so that the dark pigment remains only in the creases. The effect is then fixed by spraying a clear nitrocellulose dope over the entire surface.

The natural grain on the grains having been somewhat obliterated by the coating, this is brought out again by boarding on slanting tables, Fig. 11. The leather is folded over with the grain sides in contact and worked back and forth with a board covered with corrugated rubber.

Measuring by the ingenious machine on the right, Fig. 12, which indicates directly in square feet the area of any piece of material passed underneath its multiple rollers, completes the operations prior to packing and shipping. From 3,000,000 to 5,000,000 sq.ft. of leather is handled every month.

Data for use in connection with this article were made available through the courtesy of J. F. Conroy, Jr., and Joseph Krill, to whom acknowledgment is hereby made.

A National Problem

The Economics of Concentrated Fertilizer

What Plant Food Materials Are Available From Which We Can Make Concentrated Fertilizer?—A Timely and Important Text—Such Studies Will Help Us to Avoid an Emergency of Unpreparedness in Years to Come

By William H. Ross and Albert R. Merz
Bureau of Soils

The principal sources of each of the three essential constituents of fertilizers are saline or mineral deposits and industrial byproducts. Phosphate rock is the principal source of phosphoric acid, but the latter also occurs in bones, fish scrap and cottonseed meal. The potash used in fertilizers comes from saline and mineral deposits and from such industrial wastes as cement mill dust, tobacco stem and sugar beet liquors. Nitrogen is even more diversified in its origin, being obtained from the nitrate deposits of Chile and from the waste products of many industries.

The percentages of nitrogen, phosphoric acid and potash in almost all these raw materials are comparatively low. No nitrogen deposit or waste material contains more than 15 per cent of nitrogen. The Alsatian potash deposits may run as high as 20 per cent of potash, but there are no known deposits or materials in this country which contain in excess of 12 per cent of potash. Phosphoric acid occurs in fairly high concentration in phospate rock, but in the process of manufacture to form commercial acid phosphate this is reduced to about 16 per cent.

Other materials such as garbage tankage may contain as low as 3 per cent of available plant food. When the products from these various sources are compounded into fertilizer, the concentration of the resultant mixture must therefore always be less than that of the highest grade material used in its manufacture. Complete fertilizers have been prepared containing as low as 10 per cent of total plant food constituents and for many years the average composition of the mixed fertilizers of the country could be represented by the formula 2-8-2—i.e., 2 per cent NH_3, 8 per cent P_2O_5 and 2 per cent K_2O by weight in the mixture.

If low-grade materials could be obtained in unlimited quantity near all points of consumption, there would

perhaps be little economy in increasing their concentration, for it is recognized that the use of such materials may offer certain advantages which may be lacking in those of a highly concentrated nature: (1) They afford a market for low-grade byproducts which would otherwise be wastes in the industries; (2) the fertilizing constituents which they contain may vary greatly in availability for the plant's use and thus serve as a source of food supply for the plant during the entire growing season; (3) while many of their constituents such as sulphur and the different forms of organic matter add nothing to the commercial value of a fertilizer, they nevertheless may have a beneficial effect on many soils; (4) many low-grade materials are of good physical condition and when used in fertilizers improve the physical condition of the whole mixture, and (5) small applications of plant food per acre can be made more conveniently in the form of low-grade than very high-grade materials. It happens, however, that the greatest increase in the use of fertilizers is now taking place in states that have a limited supply of many fertilizer materials and the cost of handling and transporting low-grade fertilizers is a very serious disadvantage to their use in such localities.

This disadvantage has long been recognized and considerable advance has already been made in increasing the concentration of many materials which require shipment to a distance. Commercial Chilean caliche containing as low as 15 per cent of sodium nitrate is refined before shipment to a product of 90 to 95 per cent purity. A portion of the German potash salts that are shipped to this country have been enriched from about 9 per cent to 60 per cent potash, while a large proportion of the Western potash salts that have been produced since the war have been refined from a relatively low-grade material to one containing as high as 62 per cent of potash. By the proper selection of these and other materials the average analysis of mixed fertilizers has undergone a gradual increase, amounting to about 30 per cent in the past 10 years.

It is generally admitted, however, that fertilizers of still higher concentration are desirable, and an active

PROPERTIES OF INORGANIC MATERIALS CONTAINING PLANT FOOD CONSTITUENTS

Material	Plant Food Constituents Per Cent NH_3	P_2O_5	K_2O	Melting Point, Deg. C.	Decomposition Temperature, Deg. C.	Solubility in 100 Parts of Water	Density	Hygroscopicity	Chemical Reaction	Undesirable Properties for Use in Fertilizers	Present Use in Fertilizers
Ammonium bicarbonate	21.5	....	....	....	30-60	$27^{30°}$	1.59	Not hygroscopic	Slightly alkaline	Instability and incompatibility	None
Ammonium carbonate (commercial)	32.5	....	....	Sublimes	.....	$25.0^{15°}$	....	Not hygroscopic	Alkaline	Instability and incompatibility	Slight
Ammonium chloride	31.8	....	....	Sublimes	.....	$37.2^{20°}$	1.51	Not hygroscopic	Neutral	None	Slight
Ammonium sulphate	25.8	....	....	140	280	$75.4^{20°}$	1.77	Not hygroscopic	Neutral	None	Very extensive
Ammonium nitrate	42.5	....	....	154	185	$185^{20°}$	1.72	Hygroscopic	Neutral	None	Slight
Calcium nitrate	20.8	....	....	499	.....	$56.4^{20°}$	2.40	Hygroscopic	Neutral	Hygroscopicity	Moderate
Calcium nitrate $Ca(NO_3)_2.4H_2O$	14.3	....	....	43	.....	$134^{0°}$	1.85	Hygroscopic	Neutral	Hygroscopicity	None
Sodium nitrate	20.0	....	....	313	.....	$87.5^{20°}$	2.19	Slightly hygroscopic	Neutral	Hygroscopicity	Very extensive
Monocalcium phosphate $Ca(H_2PO_4)_2.H_2O$	....	56.3	....	...	100	decomposes	2.02	Hygroscopic	Slightly acid	Hygroscopicity	Very extensive
Dicalcium phosphate	....	52.2	....	...	.....	$0.136^{25°}$	....	Not hygroscopic	Neutral	None	Moderate
Dicalcium phosphate $CaHPO_4.2H_2O$	....	41.3	....	...	100	$0.01^{24°}$	2.32	Not hygroscopic	Neutral	None	Moderate
Tricalcium phosphate	....	45.8	....	...	1,550	$0.002^{20°}$	3.18	Not hygroscopic	Neutral	Insolubility	Moderate
Monosodium phosphate	....	59.2	....	...	190	$84.6^{18°}$	....	Not hygroscopic	Slightly acid	None	None
Monosodium phosphate $NaH_2PO_4.H_2O$	....	51.5	....	...	100	....	2.05	Not hygroscopic	Slightly acid	None	None
Monosodium phosphate $NaH_2PO_4.2H_2O$	....	45.5	....	60	.....	$110.8^{20°}$	1.95	Not hygroscopic	Slightly acid	None	None
Monosodium phosphate acid, $NaH_2PO_4.H_3PO_4$	....	65.1	....	131	.....	....	....	Very hygroscopic	Acid	Acidity and hygroscopicity	None
Disodium pyrophosphate	....	64.0	....	...	204	....	1.86	Not hygroscopic	Neutral	None	None
Disodium pyrophosphate $Na_2H_2P_4O_7.4H_2O$	....	48.3	....	...	.....	....	....	Effervesces	Neutral	None	None
Tetrasodium pyrophosphate	....	53.4	....	880	.....	6.23^{20}	2.45	Not hygroscopic	Alkaline	Incompatibility	None
Tetrasodium pyrophosphate $Na_4P_2O_7.10H_2O$	....	31.8	....	...	.....	$10.92^{20°}$	1.84	Not hygroscopic	Alkaline	Incompatibioity	None
Disodium phosphate $Na_2HPO_4.12H_2O$	....	19.8	....	35	100	$17.2^{20°}$	1.53	Effervesces	Slightly alkaline	Low m.p.	None
Trisodium phosphate	....	43.3	....	...	.....	....	2.51	....	Alkaline	Incompatibility	None
Trisodium phosphate $Na_3PO_4.7H_2O$	....	24.5	....	...	.....	....	....	....	Alkaline	Incompatibility	None
Trisodium phosphate $Na_3PO_4.12H_2O$	....	18.3	....	75	100	$28.3^{15°}$	1.63	....	Alkaline	Incompatibility	None
Potassium bicarbonate	....	....	47.0	...	110	$26.9^{20°}$	2.16	Not hygroscopic	Slightly alkaline	Incompatibility	None
Potassium carbonate	....	....	68.2	890	.....	$112.0^{20°}$	2.26	Hygroscopic	Alkaline	Incompatibility	Moderate
Potassium carbonate $2K_2CO_3.3H_2O$	....	....	57.0	900	100	$89.4^{0°}$	2.04	Hygroscopic	Alkaline	Incompatibility	Slight
Potassium chloride	....	....	63.2	782	.....	$34.0^{20°}$	1.99	Not hygroscopic	Neutral	None	Very extensive
Potassium bisulphate	....	....	34.6	197	200	$51.4^{20°}$	2.27	Not hygroscopic	Acid	Acidity and incompatibility	None
Potassium sulphate	....	....	54.1	1,054	.....	$11.1^{20°}$	2.66	Not hygroscopic	Neutral	None	Very extensive
Monoammonium phosphate	14.8	61.7	....	...	.....	$17^{10°}$	1.79	Not hygroscopic	Slightly acid	None	Slight
Diammonium phosphate	25.8	53.8	....	Unstable in moist air		$13^{15°}$	1.65	Not hygroscopic	Slightly alkaline	Instability	None
Triammonium phosphate $(NH_4)_3PO_4.3H_2O$	25.1	35.0	....	Unstable at room temp.		....	....	Not hygroscopic	Alkaline	Instability	None
Sodium ammonium phosphate $NaNH_4HPO_4.4H_2O$	8.1	34.0	....	Decomposes		$20^{0°}$	1.55	Not hygroscopic	Slightly alkaline	Instability	None
Potassium nitrate	16.9	....	46.6	339	.....	$31.2^{20°}$	2.10	Not hygroscopic	Neutral	None	Moderate
Monopotassium phosphate	....	52.2	34.6	...	400	$25.0^{7°}$	2.34	Not hygroscopic	Slightly acid	None	Slight
Dipotassium phosphate	....	40.8	54.1	...	.....	....	....	Hygroscopic	Alkaline	Incompatibility and hygroscopicity	None
Tripotassium phosphate	....	33.5	66.5	1,340	.....	....	....	Not hygroscopic	Alkaline	Incompatibility	None
Dipotassium pyrophosphate	....	55.9	37.0	...	.....	....	....	Hygroscopic	Neutral	Hygroscopicity	None
Tetrapotassium pyrophosphate	....	43.0	57.0	...	.....	....	....	Hygroscopic	Alkaline	Hygroscopicity and incompatibility	None None
Potassium metaphosphate	....	60.1	39.9	...	.....	....	....	Not hygroscopic	Neutral	None	None

campaign is now being made to increase further the analysis of mixed fertilizers and also limit the number of brands manufactured. This was clearly emphasized by the action taken at each of three conferences held during the past few months at Chicago, Boston and Baltimore and attended by agronomists of various states and representatives of manufacturers selling fertilizers in these states. At these conferences a total of thirty-two fertilizer mixtures were recommended varying in composition from 14 to 32 per cent of plant food constituents, with an average of 19 per cent. This represents an increase of about 58 per cent in concentration over the average mixed fertilizer of a few years ago.

In addition to the cost of handling and transporting there still remains a more serious objection to dependence on low-grade material for future expansion in fertilizer manufacture. This is the question of supply. A number of materials as cottonseed meal, tankage, etc., which have been so extensively used in fertilizers, are now being more and more used as feed for stock. The output of industrial byproducts such as these is dependent on the sale of the principal products and cannot therefore be increased independently of the latter to meet an increased demand for the byproduct.

To supply the probable future shortage of nitrogenous materials, attention is now being directed to a source of nitrogen that is neither mineral deposit nor industrial byproduct—viz., the nitrogen of the air. When this is fixed as ammonia, nitrogen is obtained in its most concentrated combination. Ammonia as such, however, cannot be used directly as a fertilizer and becomes suited for this purpose only when neutralized with an acid.

In recent experiments made at the Bureau of Soils and elsewhere it has been found that phosphoric acid can be volatilized from phosphate rock at a much lower temperature than has generally been supposed, and the possibilities are therefore promising that the volatilization method may ultimately compete with the sulphuric acid method in the treatment of phosphate rock. The newer method has the advantage of yielding an acid directly of most suitable concentration for combining with ammonia and for making, by substitution for sulphuric acid, many other concentrated materials such as the phosphates of sodium and potassium.

The manufacture of fixed nitrogen and of phosphoric acid thus furnishes agents for making many possible fertilizer materials which are not now extensively used in fertilizers but which may have wide application in the future if the campaign for high-analysis goods is to be maintained and if the supply of low-grade material falls short of the demand.

In the accompanying table are given the chemical and physical properties of a number of inorganic materials which contain one or more of the essential constituents of fertilizers. The incompleteness of the table is due to the fragmentary nature of the data recorded in the literature, which in addition is often very conflicting. Some of the materials listed are now widely used in fertilizers. The data for the others are supplied for the purpose of showing which materials may have future application in increasing the concentration of fertilizers and which have properties that prevent their use for this purpose unless satisfactory means is found to eliminate the properties that are considered objectionable.

Exploring Blast-Furnace Zones

One of the problems of the blast furnace has been the location of the points at which ore reduction is started and completed, in its furnace treatment. Definite knowledge on this problem has just been achieved through test runs at the experimental blast furnace of the Bureau of Mines, at the North Central experiment station, at Minneapolis. These tests show that reduction starts shortly after the iron ore has been charged and is completed at a point remarkably close

EXPERIMENTAL BLAST FURNACE OF BUREAU OF MINES

to the stockline. The ore used in this test was in particles slightly smaller than garden peas. The travel of the heat wave up the charge column, as the cold material used in filling the furnace gradually acquired heat from the ascending gases, was determined by a series of thermocouples located at five elevations in the mantle. The descent of the ore in the furnace was followed by means of gas samples taken from various planes up the side of the mantle. The test furnace was operated for 12 days and blown out empty and in good mechanical condition. During the entire run every phase of operation was under technical control, and the proof that this is possible promises possibilities of new forms of study of important furnace problems.

What Lime Is Best for Sulphite Tower Absorption?

Sulphite wood pulp is made from wood cooked with a solution of calcium bisulphite. This solution may be prepared in two ways, either by permitting sulphur dioxide to pass upward through a tower filled with limestone and allowing water to trickle down over the stone, or by passing the sulphur dioxide through milk of lime contained in a tank. In the former process, high-calcium limestone is preferred, because limestone containing much magnesium carbonate is not dissolved uniformly and is thus apt to fall to pieces and stop the circulation. In the latter process, a high-magnesium quicklime is preferred for the manufacture of the milk of lime, because the magnesia is more soluble than the lime in the sulphur dioxide solution and a liquor having higher strength can thus be prepared. It is quite possible, however, to use a high-magnesium stone in the tower process or a high-calcium lime in the milk-of-lime process. A recent publication of the Bureau of Standards, Circular 144, describes in detail the considerations entering in determining the best grades of lime to use in either process.

Ceramic Engineers Meet In Automobile Manufacturing Centers

Summer Meeting of the American Ceramic Society at Toledo, Detroit and Flint Emphasizes the Extent to Which the Automobile Industry Is Dependent Upon the Ceramic Industry for Certain Products, Such as Spark Plug Porcelain, Windshield Plate Glass and Abrasive Wheels.

EDITORIAL STAFF REPORT

ALTHOUGH realizing fully the futility of attempting to determine which element in the construction of an automobile is the most essential, it is unquestionably true that such ceramic products as porcelain spark plugs, plate glass windshields and abrasive wheels play an important part. Nor should we neglect to mention refractories, which are absolute necessities from the blast furnaces to the furnaces for heat-treating the finished metal parts. It was the privilege of those who attended the summer meeting of the American Ceramic Society at Toledo, Detroit and Flint, Aug. 8 to 11, to gain a first-hand impression of the interrelation between the ceramic and automotive industries, for the program included visits not only to the ceramic plants supplying the automobile requirements but to several of the great motor factories as well. In addition, there were of course other plants of ceramic interest.

Contrasting Types of Bottle Machines

Thus, the first plant visited in Toledo after the formalities of registration had been concluded at the Hotel Secor was that of the Owens Bottle Co. Here were seen two radically different types of Owens bottle machines fed from a single continuous tank. Both had automatic equipment for transferring the bottles from machine to leer, although here also the designs were entirely distinct.

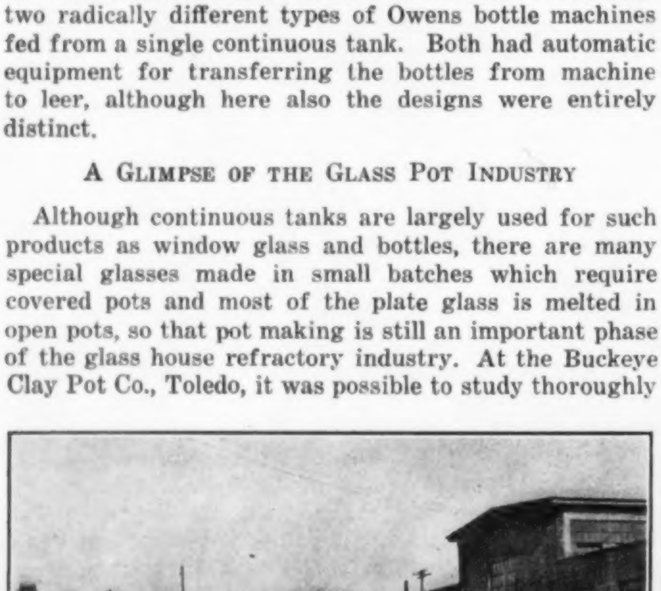
A Glimpse of the Glass Pot Industry

Although continuous tanks are largely used for such products as window glass and bottles, there are many special glasses made in small batches which require covered pots and most of the plate glass is melted in open pots, so that pot making is still an important phase of the glass house refractory industry. At the Buckeye Clay Pot Co., Toledo, it was possible to study thoroughly the methods employed in manufacturing open and closed pots as well as tank blocks and other refractory shapes. The pots are built up by hand from carefully aged and prepared clay bodies, the process requiring about 28 working days from the time the bottom is completed. It is interesting to note that tops of the closed pots are finished without the use of internal supports, the entrapped air acting as a cushion upon which the top is worked into shape. Subsequently, of course, an opening is made and formed into a boot. To facilitate drying of the bottoms, the pots are set on wooden slats covered with heavy wire netting covered in turn with a layer of coarse grog gravel.

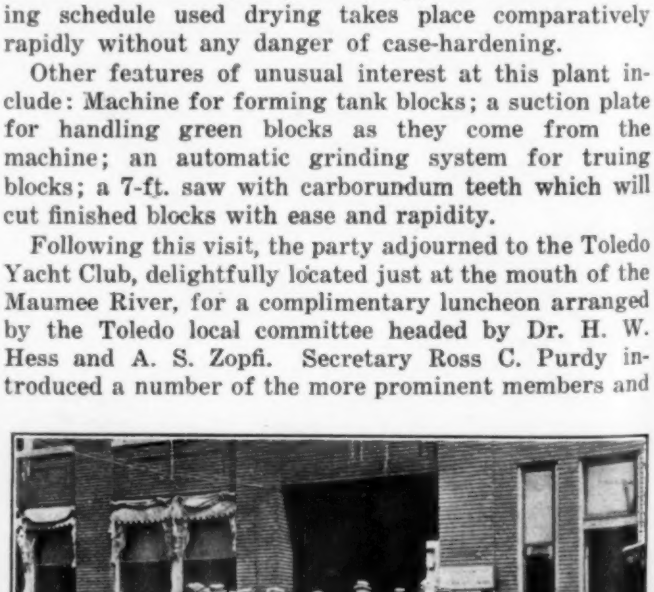
Pots are allowed to air dry and are not fired until placed in the furnace where they are to be used. Tank blocks are handled in a unique humidity drier, the side walls of which are constructed of ordinary red brick. The blocks are supported in the manner described for pots and the temperature is brought up slowly to a predetermined point by means of steam coils. While humidity control is available for emergency, it is seldom used, as the brick wall is sufficiently porous so that the moisture diffuses through it slowly, and with the heating schedule used drying takes place comparatively rapidly without any danger of case-hardening.

Other features of unusual interest at this plant include: Machine for forming tank blocks; a suction plate for handling green blocks as they come from the machine; an automatic grinding system for truing blocks; a 7-ft. saw with carborundum teeth which will cut finished blocks with ease and rapidity.

Following this visit, the party adjourned to the Toledo Yacht Club, delightfully located just at the mouth of the Maumee River, for a complimentary luncheon arranged by the Toledo local committee headed by Dr. H. W. Hess and A. S. Zopfi. Secretary Ross C. Purdy introduced a number of the more prominent members and



AFTER INSPECTING DETROIT STOVE WORKS



"SQUADS LEFT" AT THE OWENS BOTTLE CO., TOLEDO

then made each one present get up in turn and make himself known to the rest of the party.

After luncheon, most of the members took the afternoon boat to Detroit, but a small group remained to visit the Edward Ford Plate Glass Co., at Rossford. The glass is melted in nineteen furnaces, twenty pots being set in each furnace. The melting schedule is so arranged that a pot is cast every 8 minutes throughout the 24 hours. As each pot produces a sheet containing from 350 to 400 sq.ft., the magnitude of the handling, grinding and polishing operations is at once apparent. A detail which probably attracted more comment than any other operation was the amusing dance done upon the larger pieces of glass by the setting gang to insure uniform adhesion to the grinding table.

Thursday in Detroit proved to be a most strenuous day, for the morning program included the Highland Park plant of the Ford Motor Co., and in addition the Champion Porcelain Co.

Continuous Pour Plate Glass System

Having seen the usual method of plate glass manufacture the day before in Toledo, it was most instructive to study the remarkable production methods used in the motor plant and then see how these have been applied to the manufacture of plate glass, for the experimental plant using the continuous pour system is located at Highland Park. As the name would indicate, glass flows under carefully regulated conditions continuously from a tank furnace onto a conveyor, where it is formed into a sheet of the required thickness which passes through the continuous leer. At the far end, the annealed sheet is cut into approximately windshield-size pieces, which are then cemented in the usual manner to the bed of the grinding machine. This bed moves in a straight line the whole length of the building, carrying the plates of glass first under revolving grinding wheels fed with sand, then under the emery-fed wheels and finally under the series of polishing wheels. At the discharge end of this machine, the plates, completely ground and polished on one side, are removed, turned over and cemented to a duplicate machine set parallel but run in the opposite direction. This grinds and polishes the other side and delivers the finished plate ready to be inspected and trimmed for use. It was most interesting to note the extent to which standard Ford parts were used in the construction of the machines.

This represents a development which bids fair to revolutionize the industry, although production has as yet been limited to much smaller widths than would be required for many plate glass applications, such as store fronts.

At this point it would be well to insert a word of praise for the efforts of the local committees who arranged the trips and for the manufacturers who so graciously permitted these arrangements to be carried out. Instead of seeing merely a heterogeneous group of plants, it was often possible to contrast production methods for the same class of ware. One instance of this has already been given—that of plate glass.

Champion and A. C. Spark Plug Companies Show Production Methods

Another was the manufacture of spark plug porcelain. The two largest producers, Champion Spark Plug Co. and A. C. Spark Plug Co., threw their doors wide open and permitted free access to all departments. In view of the secrecy which still pervades many branches of the chemical industry, this action was little short of remarkable.

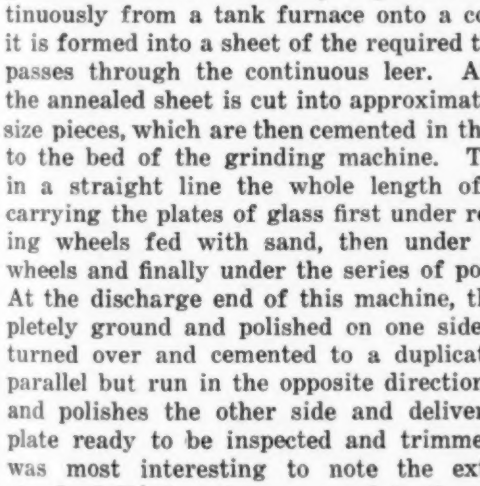
Although the Champion plant has already been described in *Chem. & Met.* ("Manufacture of Spark Plug Porcelain," A. G. Wikoff, vol. 28, p. 150, Jan. 24, 1923), there were several new developments which deserve attention. Perhaps the most important of these is the use of andalusite to obtain a high sillimanite content in the finished body. Andalusite, $Al_2O_3.SiO_2$, is transformed into sillimanite at high temperatures without change in volume, both minerals having nearly zero coefficient of expansion. This was demonstrated in a very effective manner by breaking a lump of andalusite into two pieces. After heating one of these to cone 18 (2,714 deg. F.; 1,490 deg. C.), it still fitted the unburned piece exactly. An immense deposit has been located and is being worked in California. At Detroit the lumps are crushed and then ground in two Hardinge mills in series. The first uses steel balls and the discharge passes over a magnetic separator before entering the second mill using porcelain balls made at the plant.

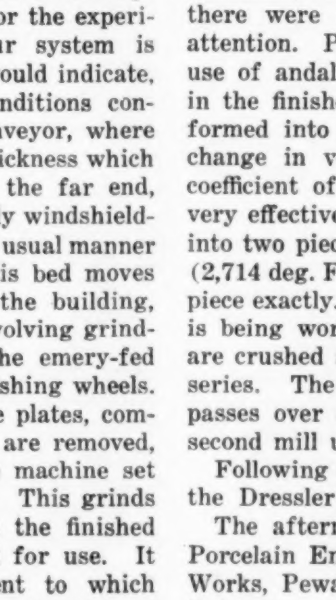
Following the inspection, luncheon was served beside the Dressler kiln.

The afternoon was spent by various groups at the Porcelain Enamel & Manufacturing Co., Detroit Stove Works, Pewabic Pottery Co., or sightseeing in Grosse Pointe.

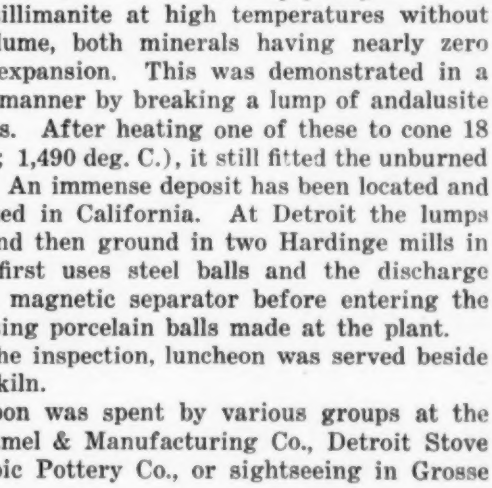
Friday morning the trip to Flint was made in special cars on the interurban electric line. Upon arrival lunch

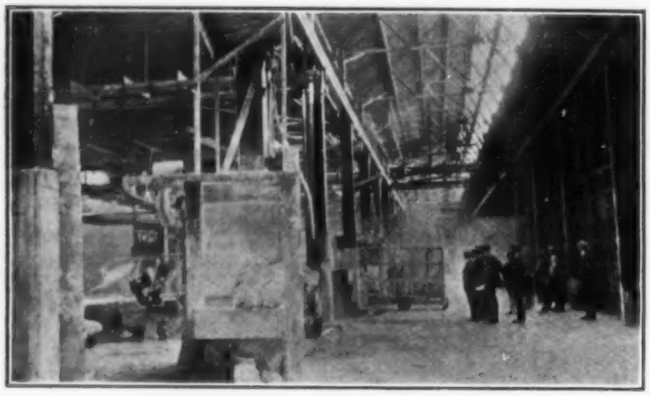
BELOW—WAITING TO SEE FORDS MADE. CENTER—SOME PRODUCTS OF THE BUCKEYE CLAY POT CO.





BELOW—TANK END OF FORD CONTINUOUS POUR PLATE GLASS MACHINE AT HIGHLAND PARK PLANT





WATCHING PLATE GLASS POLISHING OPERATIONS

was served at the Hotel Durant by courtesy of the A. C. Spark Plug Co., whose plant was then visited.

In almost every detail production methods at this plant differ from those at Champion. The batch is ground in ball mills, made into a slip in agitator tanks or blungers, passed through a magnetic separator and then filter pressed. The press cakes are cut into strips and worked in ring form by heavy corrugated rollers, instead of being pugged. Extrusion upward through suitable dies forms the blanks, which are then partly dried to a leathery consistency. In this state the plugs can be accurately turned on lathes fitted with special tools.

Drying to remove remaining air shrinkage and glazing on special spray machines complete the operations prior to burning.

Novel Tunnel Kiln

This plant has developed a high-temperature tunnel kiln which is unique. The present kiln, built after tests on a small experimental kiln had demonstrated the value of the design, is 88 ft. long and the car deck is 5 ft. wide. The ware is set in rows in square trays provided with a rim about 1 in. high. The trays are placed four abreast on the refractory car decks. It requires 13 hours for the cars to traverse the 88 ft. so that about 810 sq.ft. of car deck pass a given point in 24 hours. City gas is used as fuel and cone 16 (2,642 deg. F.; 1,450 deg. C.) is reached in the hot zone. A second kiln 93 ft. long is under construction.

Tile requirements for car deck construction have led to the use of the experimental kiln for tile manufacture, and in order to keep the kiln running an interesting side-line, faience tile, has been developed and a subsidiary company formed to market this. Some of the very pleasing effects were exhibited.

To return to the spark plug plant, the operations of machining the metal parts, forming gaskets, assembling, testing and inspecting the finished plugs were also shown. Prior to the return trip to Detroit, several departments of the Buick Motor Co. were inspected.

Short Technical Session Follows Banquet

Dinner at the Hotel Wolverine was followed by the presentation of two excellent papers. A. P. Ball of the Square D Co. described and illustrated by means of lantern slides some of the modern handling methods installed at an old electrical porcelain plant at Peru, Ind., to increase the efficiency without the delay attendant upon rebuilding the plant. Details of this work were given in an article by G. L. Montgomery, "Modern Handling Methods in the Manufacture of Electrical Porcelain," *Chem. & Met.*, vol. 27, p. 59, July 12, 1922.

Controlling Temperature of Tunnel Kiln

Some of the problems connected with the operation of tunnel kilns at high temperatures were discussed by Dr. J. A. Jeffery, president of the Champion Porcelain Co. The use of city gas has caused considerable trouble in the matter of regulation because of the fluctuations in density due to varying proportions of water gas and coal gas in the mixture. As the gas flow varies inversely as the density, the flame length is affected by any change in density, the flame length with water gas being shorter than that with coal gas, which is less dense. This property has been utilized by T. R. Harrison in developing an automatic control device. A double Pt: Pt-Rh couple is so placed in the flame of a burner connected with the gas supply that a change in flame length produces a flow of current which is used to operate mechanism controlling the main gas valves. Additional control is provided through six thermocouples in series, three on the west side and three on the east side of the kiln. The lag between change in kiln temperature and operation of the control mechanism has been reduced to such an extent that an accuracy of ± 2 deg. (checked by optical pyrometer) is now possible. For details of this ingenious mechanism, readers are referred to the complete paper which will be published in the *Journal of the American Ceramic Society*.

Making Abrasive Wheels

Saturday morning en route to the River Rouge plant of the Ford Motor Co. a stop was made at the plant of the Detroit Star Grinding Wheel Co.

For vitrified wheels, properly sized grains of fused bauxite are mixed with clay bond in water suspension and poured into paper-lined steel rings. After the cakes have set they are dried, placed in saggers and burned in coal-fired kilns to cone 12 (2,498 deg. F.; 1,370 deg. C.). The wheels are then trued up by means of hollow conical high-carbon steel cutters, graded and tested for balance.

Silicate wheels consist of a mixture of abrasive grains, sodium silicate, zinc oxide and a little clay pressed into shape and heated to moderate temperatures between heavy iron flanges.

Shellac is used as a bond in the preparation of some wheels, particularly the very thin ones used for cutting metal. The grains and shellac are mixed in a steam-heated trough which softens the shellac. The wheels are formed in hydraulic presses and baked in electric ovens. Rubber is also used to bond special wheels.

The trip through the River Rouge plant included the Semet-Solvay coke ovens, the coal and ore docks, the blast furnaces, a glimpse of the casting floors, the electric steel furnaces, the wood-working department. The sawdust recovered from cyclone collectors at the latter plant is converted into heavy cardboard in a well-equipped mill. Opportunity was also afforded to see in operation the first unit of the large plate glass plant using the continuous pour process described previously.

Somewhat fatigued, but borne up by the inspiration of new ideas gleaned from the experience of others, the party disbanded on Saturday afternoon. In all about 125 members and guests had been in attendance and these had become much better acquainted than is possible at the more formal technical meetings.

Commercial Ethylations With Diethyl Sulphate

A Comprehensive Discussion of the Reactions in Which Diethyl Sulphate Is Used and of the Best Proportions of Reagents for Optimum Results —An Indication of Increasing Commercial Importance of This Product*

BY ARTHUR R. CADE
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University of Pittsburgh, Pittsburgh, Pa.

There has grown up along with the extensive literature of science and technology a fringe of "facts" that aren't so. Among other such items is the conviction widespread and firm that diethyl sulphate is a poison. This interesting work of Mr. Cade has confirmed the work of predecessors in establishing the fact that diethyl sulphate is non-toxic and has cleared the way to a greater field of activity for this valuable reagent.

DIETHYL SULPHATE [ethyl sulphate, $(C_2H_5)_2SO_4$] has been known since 1848, when it was first described by Wetherill, who prepared it by the action of sulphur trioxide on absolute ethyl ether. (See *Ann.*, 1848, vol. 66, p. 117.) Nevertheless it has been only during the past 10 years that any great amount of experimental work has been done on the use of this reagent. Only within the last few years has it found wide application in the arts as a most satisfactory general ethylating agent. Its methyl homolog (dimethyl sulphate) has been known and widely used commercially for a long time.

The chief reasons why the neutral ethyl ester of sulphuric acid, $(C_2H_5)_2SO_4$, has been slow to follow its methyl homolog are twofold. First and mainly, diethyl sulphate has not been available for use in large quantities and in a pure state until recently. Second, more or less erroneous and misleading information concerning its chemical, physical and physiological properties has appeared in the literature as a result of the work and writings of the early investigators. More recent investigators are beginning to show a marked interest in this new product since it has become available to them in a good state of purity and in large quantities. The results of their work, appearing scattered through the recent journal and patent literature, are very favorable and are continuously proving the value of diethyl sulphate for all types of ethylations.

This present work of the writer was taken up to correlate the many loose individual facts and data already available on this subject, to check and substantiate these data wherever possible, and to explore new fields of usefulness for diethyl sulphate as a practical ethylating agent applicable in the industries of today.

Diethyl sulphate is, when pure, a colorless liquid with a pleasant though faint ethereal odor. It boils without decomposition at 96 deg. C. at 15 mm. pressure, and at 120.5 deg. C. at 45 mm. pressure. At temperatures above 150 deg. C. it begins to decompose slowly, and at 208 deg. C. it boils with considerable decomposition; the true boiling point probably lies several degrees higher. It has the density of $D\,\frac{19}{4}$ equals 1.1837. On cooling it forms crystals which melt at — 24.5 deg. C. This liquid is entirely neutral in reaction. It is nonmiscible with cold water; with warm water it is slowly hydrolyzed, and on boiling it yields eventually 2 mols of ethyl alcohol and 1 mol of sulphuric acid. Diethyl sulphate is non-flammable.

NATURAL ADVANTAGES OF DIETHYL SULPHATE

Diethyl sulphate possesses several valuable natural advantages, each of which points favorably toward the use of this material as a practical ethylating agent to replace the other alkylating reagents as now used. (*Cf*. also Curme, *Chem. & Met.*, vol. 25, pp. 957-8, Nov. 23, 1921.) Chief among these advantages are ease of manipulation, low working pressures, intensity of reaction and ready availability. It is non-toxic, non-flammable and non-corrosive.

Having such a low vapor tension, due to its relatively high boiling point (208 deg. C. at 760 mm.), it is possible to work with diethyl sulphate in vessels provided with an ordinary reflux apparatus, in place of autoclaves required for the use of the ethyl halides. This feature eliminates the expense of autoclaves, as well as the dangers of high pressures accompanying the use of pressure reactions.

No toxic effects, similar to those noted and reported for dimethyl sulphate, are produced in the handling of diethyl sulphate. This is contrary to some incorrect statements which have appeared in the literature. Weber reports serious toxic effects due to dimethyl sulphate poisoning, but in the same article states that the acute inflammation characteristic of dimethyl sulphate is not noted at all in the case of diethyl sulphate. (See *Arch. exp. Path. Pharm.*, 1901, vol. 47, p. 113.) This fact has been substantiated by the writer and others who have worked with the material over a long period of time. Closely observed, large-scale operations with diethyl sulphate over a period of years have failed to indicate the slightest danger attending its use. Absolutely no harmful effects have been noted in any case. All that is necessary is to observe the ordinary precautions that should be observed in the use of any organic substance.

Advantages to be derived from the non-flammable and the non-corrosive nature of the reagent are apparent and need not be discussed to any extent here.

Concerning the intensity of reaction, it suffices to state that in general the reaction of the first ethyl group in diethyl sulphate is extremely rapid even at room temperatures and temperatures around 50 to 55

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deg. C. In some cases a slightly higher temperature of around 110 deg. C. is required to bring about complete reaction in the shortest time. A still higher temperature of around 145 deg. C. and a longer time of heating are required for the second ethyl group to react efficiently as an ethylating agent. In other words, one ethyl group of diethyl sulphate reacts spontaneously and vigorously, while the other ethyl group reacts like the ethyl in sodium ethyl sulphate, and is therefore of less intensity.

Type Reactions Using Diethyl Sulphate

Experiments have been conducted to test the applicability of diethyl sulphate in a variety of compounds, amplifying the data given by previous workers. Concrete examples of specific type reactions have been selected in order to determine just how diethyl sulphate reacts in each of these types and at the same time to find out as far as possible those conditions which would bring about the most efficient use of diethyl sulphate as a commercial ethylating agent.

It has not been possible to cover the field in its entirety or even to ascertain the ideal conditions in each case, for the specific examples chosen. It is hoped, however, that the information found will serve as a good foundation and that by utilizing this information, from the experimental work described here, others who are interested can take it up from this point and carry on further work, applying the same to their specific problems. General types of compounds were chosen with which to form the alkylated derivatives. These include ethers, esters, amines and imides.

For this work a commercial grade (94 to 96 per cent) and a c.p. grade (practically 100 per cent) of diethyl sulphate were used. This material was entirely free from foreign aliphatic radicals, thus insuring that only ethyl derivatives would be produced. In this work the effects of temperature, presence of water, time of heating, presence of alkali, etc., have been studied and conditions have been worked out whereby one or both ethyl groups can be utilized.

Ethers—Hydroxy compounds—e.g., alcohols, phenols, naphthols, etc.—react readily with diethyl sulphate to form ethers. To obtain the highest yields it is best to carry out the reactions in the presence of an alkali or alkaline earth hydroxide or carbonate, or of any substance capable of neutralizing or removing any free acid which might form during the reaction. It is found desirable in many cases to use alkali salts—e.g., sodium alcoholate, sodium phenolate, etc.—in the place of the free alcohol or phenol.

Aromatic Ethers—For the preparation of the aromatic ethers, diethyl sulphate works best where all dry reagents are used, although it is not absolutely necessary that all traces of water be absent, as shown by the following experiments.

Phenol Ethyl Ether, Phenetol, $C_6H_5OC_2H_5$—This substance was prepared in a good degree of purity and in excellent yields by mixing slightly in excess of an equivalent amount of finely powdered caustic soda with liquid phenol and maintaining the mixture at a temperature around 110 deg. C. while an equivalent amount of diethyl sulphate was gradually added. Heating at 110 deg. C. was continued for 1 hour after all the diethyl sulphate had been added. The temperature of the mixture was then raised to 145 deg. C. and maintained there for 3 hours longer with frequent stirring. Care was taken not to mix the reagents too rapidly, as there was a tendency for a vigorous reaction to occur with the generation of considerable heat. The reaction mixture thus obtained consisted of an oil (phenetol) and a crystalline solid (sodium sulphate), from which the former was recovered by means of a vacuum distillation. The crude product was washed with water containing 5 per cent of caustic soda, to free it of any unused phenol, and then redistilled under atmospheric pressure. It boiled at 171 deg. C. By analysis it was found that 95 per cent of the original phenol had been converted to the ethyl ether, there being 5 per cent of the material recovered unused. A yield of 95 per cent on the basis of both ethyl groups reacting was obtained.

Using sodium phenolate in place of phenol plus caustic soda gave similar results, with slightly better conversions and yields, due to a better contact between reacting particles being possible in the former case. The sodium phenolate used contained approximately 15 per cent moisture.

When the ethylation of phenol was carried out in a dilute aqueous caustic solution only one ethyl group reacted instead of both as in the two experiments above. Approximately 100 per cent yield on the basis of the one ethyl group was obtained.

Beta Naphthol Ethyl Ether, Nerolin, $C_{10}H_7OC_2H_5$—By a process analogous to the one above, and using beta naphthol in place of phenol, an excellent yield of Nerolin was obtained. The procedure follows:

One mol of beta naphthol was heated to melting (122 deg. C.). Slightly in excess of 1 mol of finely powdered caustic soda and ½ mol of diethyl sulphate were then added alternately in small portions, maintaining a temperature around 145 deg. C. at all times. Care was taken not to add the materials too rapidly, lest too great an amount of heat be evolved and the material charred. After heating, with frequent stirring, for 3 hours longer at 145 deg. C. the reaction mixture was distilled directly in vacuum. An oil came over at around 140 deg. C. at 12mm. pressure, which oil solidified in the receiver when cooled. It was purified by a redistillation in vacuum and gave thereby a pure white product which melted sharply at 32.5 deg. C. A 92 per cent yield, on the basis of both ethyl groups reacting, was obtained.

Miscellaneous Substituted Ethers—Preliminary work on the preparation of substituted ethers, such as p-amino phenol ethyl ether and p-nitro phenol ethyl ether, was carried out in a qualitative manner. The results indicated that the diethyl sulphate is applicable in the preparation of these materials and of others of similar nature.

Alpihatic Ethers—Only a brief study of these ethers has been made owing to their similarity to the aromatic ethers.

Diethyl Ether—When 2 mols of ethyl alcohol was allowed to react with 1 mol of diethyl sulphate the odor of ethyl ether was apparent immediately. The reaction was not vigorous and the amount of ether liberated, even when heated, was not great. However, upon the addition of an equivalent amount of caustic soda the reaction became vigorous immediately, much heat was generated, and copious amounts of ethyl ether were evolved.

Mixed Ethers—In an analogous way isopropyl ethyl ether and butyl ethyl ether were prepared.

Cellulose Ethyl Ether—Following procedures as sug-

gested by Lilienfeld's and by Dreyfus' patents on this subject, a quantity of mixed ethyl ethers of cellulose were also prepared, by treating cotton cellulose with caustic soda and then heating this mixture with diethyl sulphate at around 55 deg. for several hours. [See Worden, "Technology of Cellulose Esters," vol. 8, p. 2505; West, *Paper*, Aug. 4, 1920, p. 15; Lilienfeld, U. S. Pats. 1,217,027 (1917), 1,217,028 (1917), 1,350,820 (1920), 1,444,257 (1923).]

Ethylene Glycol and Glycerol Ethyl Ethers, $C_2H_4(OC_2H_5)_2$ and $C_3H_5(OC_2H_5)_3$—The previous experimental work described suggests the possibilities of other preparations such as the mono- and di-ethyl ethers of ethylene glycol and glycerol mono-, di- and tri-ethyl ethers, which compounds may find commercial applications in the perfume, pharmaceutical and other industries.

Carboxylic Acid Esters—Carboxylic acids, or preferably their alkali salts, alkylate to form their respective ethyl esters by means of diethyl sulphate. In order to obtain the maximum yields it is necessary that water be eliminated from the reaction mixtures as much as possible. The presence of water in any great amount causes hydrolysis of the esters and thus lowers the yields. This disadvantage, of course, is present in all ester-forming reactions and is not a disadvantage of diethyl sulphate reactions alone. Thorough mixing to prevent occlusion of particles and to permit thoroughness of reaction by intimate contact between reacting particles is very essential. When dry reagents are used in the above manner, good yields are obtained. Furthermore, it has been found that an improvement in the above process is accomplished by the use of a non-aqueous solvent. When such foreign solvents as benzene, toluene, etc., are used, difficulties arise such as that of separating the solvent from the desired ethylated product and that of possible fire hazards. As a result of this experimental work a general method has been worked out, utilizing the product of reaction as a common solvent as shown in the following procedures.

Ethyl Benzoate, $C_6H_5COOC_2H_5$— One mol of dry sodium benzoate was treated with ½ mol of diethyl sulphate and the mixture heated for 5 hours, with occasional stirring, at 145 deg. C. The reaction mixture was then distilled in a vacuum and the ethyl benzoate thus recovered. The boiling point of this material was 112 deg. C. at 32 mm. pressure. The conversion was somewhat low, there being 30 per cent of the sodium salt recovered unethylated, due to lack of proper contact while heating. Correcting for recovered material, however, the yield was high, being 90 per cent or better. The method of using a common solvent, consisting of 1 mol of preformed ethyl benzoate in this particular experiment, gave a much higher conversion and a similar yield on the basis of both ethyl groups reacting. Duplicating the above reaction in the presence of a small amount of water used in place of the common solvent, a lower yield of ethyl benzoate (60 per cent) was obtained, due to hydrolysis of the ester by the water present.

Ethyl Oxalate, $(COOC_2H_5)_2$—One mol of sodium oxalate was treated with 1 mol of diethyl sulphate and the two were thoroughly mixed with 1 mol of previously formed diethyl oxalate. This mixture was heated at a temperature of 145 deg. C. for a period of 5 hours, after which the contents were vacuum distilled. By this process, correcting for recovered material, an increase in the amount of diethyl oxalate present was obtained equivalent to a 90 per cent yield on the basis of both ethyl groups reacting.

Ethyl Cinnamate, $C_6H_5CH\text{-}CHCOOC_2H_5$—Using 1 mol of sodium cinnamate and ½ mol of diethyl sulphate and distilling the mixture in a vacuum after heating it for 5 hours at 145 deg. C. 10 per cent of the sodium salt was recovered unused. A yield of ethyl cinnamate equivalent to 92 per cent on the basis of both ethyl groups reacting was obtained, correcting for the recovered material.

Ethyl Stearate, $CH_3(CH_2)_{16}COOC_2H_5$—By treating 1 mol of sodium stearate with a slight excess of diethyl sulphate and heating the mixture at a temperature not exceeding 130 deg. C. for several hours, a good yield of ethyl stearate was obtained. Exact quantitative data were not recorded. This process worked satisfactorily enough, however, to recommend it as a general method for the preparation of ethyl esters of fatty acids of high molecular weight.

Ethyl Phthalate, $C_6H_4(COOC_2H_5)_2$—Qualitative experiments were run using equimolecular amounts of sodium phthalate and diethyl sulphate in the presence of a mol of diethyl phthalate and heating this mixture for 5 hours at 145 deg. C. The results obtained showed the process to be applicable for the formation of diethyl phthalate.

Miscellaneous—It was found necessary in certain of these experiments to remove a slight excess of the diethyl sulphate present before the reaction mixture could be distilled and the disired product isolated therefrom. In the preparation of ethers and amines which are not readily hydrolyzed this can be accomplished by a short boiling with water, but in the case of these esters such a process would cause hydrolysis of the ester desired as well as that of the excess diethyl sulphate. Under such conditions, and especially in preparations where the acid radical is relatively much more costly than the ethyl group, a general and satisfactory method for removing any slight excess of diethyl sulphate consists in boiling the crude reaction product for a short time with a slight amount of the sodium salt of the acid.

As found by certain experimenters and confirmed by the writer, potassium salts in many cases give higher yields and greater ease of reaction than sodium salts do when used for analogous experiments. (See Graebe, *Ann.*, 1905, vol. 340, p. 244.) In practically all of the experimental work described in this paper, only the sodium salts were used. However, it should be borne in mind that there is a possibility, worth while investigating by anyone specifically interested, that sufficiently higher yields might be obtained utilizing this proposed change to warrant the use of the more expensive potassium salt for the sodium salt in some specific cases.

Inorganic Esters

Diethyl sulphate reacts in the dry with all of the alkali halogen salts to form the respective halogen esters. However, the order of efficiency is the same as the order of stability of the ethyl halides, as shown by the following procedures. Similar results were obtained when aqueous solutions were used, but in the latter case only one ethyl group of the diethyl sulphate is available for ethylating the halogens. In the case of the iodide

better results were obtained by the aqueous method than the dry, due to decompositions brought about by heating the latter.

Ethyl Chloride, C_2H_5Cl—One-half mol of diethyl sulphate was intimately mixed with 1 mol of finely pulverized sodium chloride and the mixture heated to 200 deg. C. The vapors which began to appear in a short time were collected and found to be ethyl chloride. A yield of 60 to 65 per cent, on the basis of both ethyl groups reacting, was obtained.

Ethyl Bromide, C_2H_5Br—Using a process similar to the above with sodium bromide in place of sodium chloride, a 51 per cent yield of ethyl bromide, on the basis of both ethyl groups reacting, was obtained. A small amount of free bromine was generated, showing slight side reactions.

Ethyl Iodide, C_2H_5I—The same process applied to sodium iodide caused too great an evolution of free iodine to make it practical. However, when 1 mol of sodium iodide in 100 c.c. of water was treated with 1 mol of diethyl sulphate and the mixture heated, a yield of 85 per cent ethyl iodide, on the basis of one ethyl group reacting, was obtained. Similar experiments utilizing sodium bromide and sodium chloride respectively gave indications of equal or better results.

Diethyl Sulphide, $(C_2H_5)_2S$—Diethyl sulphate reacts with sodium sulphide in alkaline solution to give diethyl sulphide. When 1 mol of sodium sulphide was fused with 1 mol of caustic soda and to this mass was added slowly 1 mol of diethyl sulphate, a violent reaction ensued at about 110 deg. C. and an insoluble oil distilled over. This oil boiled between 91 to 93 deg. C. Yield, 70 to 80 per cent based on both ethyl groups reacting.

Ethyl Mercaptan, C_2H_5HS—Likewise by treating a concentrated solution of sodium hydrosulphide (2 mols), heated to gentle boiling, with 1 mol of diethyl sulphate a reaction was immediately apparent. An oily distillate came over, from which the upper layer was separated. This material boiled between 35 to 40 deg. C. and was ethyl mercaptan. Yield, 70 to 80 per cent based on both ethyl groups reacting.

Reactions With Amines

For the preparation of alkylated amines diethyl sulphate works very easily, intensely and efficiently. Either one or both ethyl groups may be made use of, forming mono- and di-substituted amines, depending upon the conditions under which the reaction is carried out.

Mono- and Di-ethyl Anilines—The ethylation of aniline by means of diethyl sulphate is characterized by quickness and completeness of reaction, ease of manipulation and relatively low costs. No autoclaves are necessary, no high pressures are developed, the time required for the reaction is small and the working up of the material is fairly simple. All that is necessary is a closed vessel, fitted with a tight reflux apparatus and working under atmospheric pressure. With proper precautions as to temperature control and stirring, even the reflux apparatus is not necessary.

It has been found by the writer that the simple expedient of adding dry hydrated lime to aniline and then treating this mixture with diethyl sulphate and heating makes it possible to utilize both ethyl groups of the diethyl sulphate to alkylate the aniline and practically pure diethyl aniline can be prepared in this manner. When no lime is used—that is, when 1 mol of aniline is added to 1 mol of diethyl sulphate—the reaction ensues unassisted. Considerable heat is developed and it is necessary to keep the mixture well stirred and the temperature controlled at 55 to 85 deg. C. The reaction is over in a few minutes time, although it is recommended that the mixture be kept stirred for a period of ½ to 1 hour in order to insure complete reaction. At the end of this time the mixture has become viscous. It is then taken up in a little water, in which it is completely soluble. The solution is then made alkaline with caustic soda. This causes the ethylated anilines to separate out as an oil which floats to the top and which can be separated off and redistilled, or steam distilled, as desired. Theoretically the reaction involved is as follows:

$$C_6H_5NH_2 + (C_2H_5)_2SO_4 = C_6H_5NHC_2H_5 + C_2H_5HSO_4 = C_6H_5NHC_2H_5, C_2H_5HSO_4$$

Actually the aniline is not all converted to monoethyl aniline, a small amount of the monoethylated product being converted further to diethyl aniline and, as a result, an equivalent amount of unused aniline remains.

In this latter process only one ethyl group of the diethyl sulphate is utilized in ethylating the aniline. This is due to the fact that the second ethyl group becomes bound up as ethyl hydrogen sulphate and forms, as such, a double salt with the base. Heating this double salt at relatively high temperatures (around 185 deg. C.) did not bring about a molecular rearrangement and thereby make available the second ethyl group. Even higher temperatures were tried out in order to bring about this desired rearrangement, but such usually caused a general decomposition of the material.

Diethyl Aniline—To prepare pure diethyl aniline and at the same time utilize both ethyl groups of the diethyl sulphate the following process was found very satisfactory. Several factors such as temperature, time of heating and concentration of reacting materials can be varied in many different ways to give a variety of results. All cannot be discussed in detail here. The following detailed outline will give the best general method as a basis, which can be made use of and varied at will by those interested to meet their specific needs.

To 1 mol of aniline, which was contained in an iron vessel provided with a stirring device, thermometer well and reflux condenser, was added 1.2 mols of dry powdered calcium hydrate. This mixture was then well stirred and 1.1 mols of commercial diethyl sulphate added, the addition being made in 4 or 5 portions spread over an interval of ½ to 1 hour's time. About 5 minutes after the addition of each portion of diethyl sulphate the temperature of the batch began to rise quite rapidly, and it was found out that this rise must not be allowed to go beyond 85 deg. C. When this temperature peak had been reached and the thermometer showed a lowering again, then the second portion of the diethyl sulphate was added, continuing the addition in this manner until all had been added.

After the last heat rise had begun to subside the vessel was heated externally and the temperature of the mass brought up to 110-115 deg. C. At this point considerable amounts of steam were evolved, and the vapors were allowed to pass through the upright reflux condenser, thence through an inclined condenser—water cooled—in order to collect the small amount of partly ethylated aniline that was mechanically carried over with the steam. This oil was separated from the water and returned to the reaction mass. The temperature was then gradually raised to 145 deg. C. and maintained

there for 4 hours. Thorough stirring was continued during the entire process.

After this 4-hour heating the mass was steam-distilled and the ethylated aniline thus obtained analyzed approximately 90 per cent diethyl aniline and 10 per cent monoethyl aniline. No trace of unused aniline was present as shown by the sulphuric acid test and also by the zinc chloride test. The heat rise of the mixture, caused by the addition of 5 c.c. of acetanhydride to 5 c.c. of the ethylated aniline, was 9 to 10 deg. C.

When 1.4 mols of diethyl sulphate was used instead of 1.1 as just described, the final product analyzed 98 per cent diethyl aniline or better. The yield of the ethylated product in either case was 90 per cent or better on the basis of the aniline used.

It will be noted that an excess of diethyl sulphate is called for in the latter case where a practically pure diethyl aniline is prepared. This is partly due to the fact that the commercial grade of diethyl sulphate was only 94 to 96 per cent pure, and partly due to equilibrium considerations. It is probable that longer heating would produce the same effect with less diethyl sulphate.

It would thus seem that the above method is the best and least troublesome one for the preparation of diethyl aniline. The diethyl sulphate may be handled without caution, no recovery processes are necessary, as is the case where ethyl bromide is used, and no pressure equipment is necessary.

Aliphatic Amines—In a manner comparable to the preceding experiments on aniline an effort was made to ethylate ammonia, and a strong reaction was noted when dry ammonia gas was passed through diethyl sulphate. Much heat was developed and the reaction product obtained was entirely soluble in water. Upon treatment with alkali, gases were produced which were condensed and later identified, by passing into a hydrochloric acid solution, as ethyl amine hydrochloride. Some higher boiling liquids were also obtained, which were mixtures of di- and tri-ethyl amines. Similar experiments using urea in place of ammonia were run and somewhat analogous results obtained, some mono-, di- and tri-ethyl amines being produced and identified.

Imides—Before alkylating compounds of this type it is necessary to first form a metallic salt, preferably sodium or potassium. Both salts were tried out in this work, the latter being found the more satisfactory.

Ethyl Carbazol—This substance was prepared in a good degree of purity and a favorable yield by the following process. One mol of carbazol, commercial grade, was treated with 1 mol of finely pulverized caustic potash and the mixture heated to fusion. The mass, when cooled, was ground up and remelted. It was then reground to a fine powder and 1 mol of diethyl sulphate added. In a short time a vigorous reaction ensued. The mixture was thereafter heated on a water bath for 3 hours and the mass vacuum distilled, whereupon the ethyl carbazol distilled over at approximately 195 deg. C. and 16 mm. pressure. The product was colored slightly pink, but melted between 60 and 64 deg. C. On recrystallizing from alcohol a pure white crystalline product was obtained which melted sharply at 66 to 67 deg. C. The yield obtained in one experiment was around 60 per cent, although it is very certain that a much higher yield is possible with better stirring during the heating and distillation. A similar experiment carried out in toluene solution as a solvent gave analogous results.

As a result of this investigation, the following general and specific conclusions have been drawn:

1. Diethyl sulphate has reacted under various conditions as a most satisfactory general ethylating agent for the preparation of ethyl ethers, esters, amines and imides.

2. Diethyl sulphate reacts best, utilizing both ethyl groups, with dry reagents, but absolute dryness is not a necessity.

3. Diethyl sulphate reacts in the presence of large amounts of water to the extent of one ethyl group reacting completely, whereas the efficiency of the second ethyl group is somewhat impaired under these conditions.

4. One ethyl group in diethyl sulphate reacts easily and completely at room temperatures under many conditions, but a temperature of around 110 deg. C. has been found more favorable for the most efficient utilization of this one ethyl group, while a temperature of around 145 deg. C. and a prolonged heating for 3 to 5 hours is essential for the utilization of the second ethyl group as an ethylating agent.

5. Ethers, both aromatic and aliphatic, are prepared readily in practically theoretical yields, utilizing both ethyl groups, by the heating of the corresponding alcohol or phenol in the presence of an alkali. Small amounts of water present are not harmful. When large amounts are present only one ethyl group reacts.

6. Diethyl sulphate reacts vigorously with amines at room temperatures, yielding a mixture of mono- and di-ethylated products, depending upon the conditions of the reaction. Only one ethyl group reacts, the other being transferred to an ethyl hydrogen sulphate molecule, which combines with the ethylated amine to form a water soluble salt therewith. By the use of hydrated lime and heating for a time at temperatures between 140 and 145 deg. C. the second ethyl group may also be utilized to ethylate the amine.

7. Diethyl sulphate reacts favorably to form the ethylated imides, by merely mixing the former in the dry or in a suitable solvent with the alkali imide salt.

8. Many acids, preferably their alkali salts, react readily with diethyl sulphate to form the respective ethyl esters. Yields nearing the quantitative are obtainable in most cases provided a suitable means is applied to remove the ester as formed and to prevent its hydrolysis. The use of potassium salts gives better efficiency than that of sodium salts.

9. Being non-flammable, non-toxic, non-corrosive and of low volatility, diethyl sulphate should find favorable use in the arts, replacing other ethylating agents which require pressure reactions and which do not possess such remarkable ease of factory manipulation.

10. Diethyl sulphate, being available in large quantities and in a good degree of purity, free from even traces of homologous hydrocarbon radicals, should find wide use in the preparation of pure ethyl derivatives, where traces of the homologous methyl or propyl derivatives are undesirable.

11. Requiring a minimum of plant equipment and having no expensive acid radicals to recover are other factors favorable to the use of diethyl sulphate, especially for the smaller manufacturer.

12. The relative cheapness of diethyl sulphate, together with the previously mentioned advantages, should tend to bring about the utilization of this alkylating agent for the preparation of ethylated compounds to supplant many of the methylated compounds now prepared from the more expensive methyl alcohol.

Simple Method of Determining Apparent Densities

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The density of a body is defined as its weight per unit volume; or, in mathematical terms,

$$D = \frac{W}{V} \quad (1)$$

where D represents density, W weight, and V volume. The term V in this equation may be determined by measuring the dimensions of the object, but is most commonly found from the weight of the body in air, and its loss of weight when suspended in a liquid of known density. If the weights in air and liquid are denoted by W_1 and W_2 respectively, and the density of the liquid by d, equation (1) becomes,

$$D = \frac{W_1}{W_1 - W_2} d \quad (2)$$

For many purposes, water is used as the liquid in which suspended weights are determined, in which cases, unless a high degree of accuracy is required, equation (2) may be simplified by neglecting the term d; that is,

$$D = \frac{W_1}{W_1 - W_2} \quad (3)$$

The densities of continuous substances, such as glass and metals, as determined by methods based on equations (1), (2) and (3), are actual densities; while in the case of porous materials, like coke, brick, etc., equation (1) gives, not the actual density of the substance composing the body, but the apparent density of the body as a whole. Determinations made by procedures based on formulas (2) and (3)—that is, by loss of weight or displacement methods—cannot be employed for porous bodies, because these absorb liquid and cause the suspended weight to be in error by an amount equal to the weight of liquid taken up, and introduce a corresponding error into the indicated apparent density.

Since a more or less exact knowledge of apparent density is often essential, it is highly desirable that accurate methods for the determination of this value be available. An expedient sometimes adopted is to prevent absorption of liquid by coating the sample with a layer of some impervious substance, such as paraffin, for instance, when water is used.

In order to retain the advantages of the displacement methods and to eliminate their inherent error when applied to porous objects, as well as to avoid coating with a waterproof layer, the usual procedure consists in replacing the gases in the voids throughout the piece with water. This is done either by boiling for a number of hours at atmospheric pressure or by a shorter period of boiling under reduced pressure, after which treatment the suspended weight of the sample is found in the customary manner. The difference between the saturated and dry weights is, of course, the weight of water absorbed and is also the amount by which the suspended weight would be erroneous if no account was taken of absorbed water. If the saturated weight is designated by W_3, the apparent density or, as it is called in ceramic work, the bulk specific gravity, D_a, is now given by the expression

$$D_a = \frac{W_1}{W_3 - W_2} \quad (4)$$

this being equation (3) corrected for absorbed water.

The above-mentioned method of vacuum boiling, while yielding accurate and consistent results, is open to the objection that the time required is considerable. Different standard methods specify that samples shall be boiled for 2 hours at normal pressure or for 1 hour under reduced pressure. (*Cf.* Year Book, J. Am. Ceram. Soc., Vol. 5, No. 4, Part 2, 1921-2.) In the succeeding paragraphs evidence will be presented, from theoretical and experimental grounds, that accurate results can be obtained without boiling. In the discussion following, water will be taken as the liquid in which suspended weights are found, but any other liquid may be employed, provided it does not dissolve or otherwise affect the sample, and the density of the liquid is considered.

Let us first examine the premises on which equation (4) is based. A porous body, weighing W_1 grams in air, is suspended in water and its immersed weight found to be W_2 grams. This weight (W_2) includes the suspended weight of the sample plus the weight of water that it absorbed while immersed. After removing the water adhering to the surface and reweighing in air, the weight is W_3 grams. The weight of water taken up is therefore ($W_3 - W_1$) grams. If no absorption of water had taken place, the suspended weight would have been less than the observed suspended weight by an amount equal to the absorbed water; or in other words, the true suspended weight is $[W_2 - (W_3 - W_1)]$ grams. It is obvious that the same volume of water is displaced by the sample after it has absorbed water as it would have displaced if there were no absorption. hence the volume of the body is $\{W_1 - [W_2 - (W_3 - W_1)]\}$ c.c., and its apparent density is

$$D_a = \frac{W_1}{W_1 - [W_2 - (W_3 - W_1)]}$$

On reducing the above expression, we obtain

$$D_a = \frac{W_1}{W_3 - W_2}$$

which is equation (4) previously mentioned.

It will be noted that in the derivation of equation (4) no assumption was made regarding the quantity of water taken up by the sample during weighing. When we recall that the value of the term W_3 is directly proportional to that of W_2, it follows that their difference ($W_3 - W_2$) is constant, regardless of whether absorption of water is complete or only partial. Figures for apparent densities (or bulk specific gravities) obtained by the ordinary loss of weight method of determining real densities should therefore be identical with those obtained by the standard methods of boiling at various pressures, provided the samples are reweighed in air after weighing in water.

In order to test the above conclusions, the apparent densities of a number of materials of different porosities were determined by both methods: first by simple suspension, and then by boiling under reduced pressure. For the sake of an additional comparison, a number of samples of the softer materials were cut to regular shapes, so that their dimensions could be measured with a vernier caliper and apparent densities found by means of equation (1).

The apparatus used was a Sartorius analytic balance, from the left-hand stirrup of which was hung a harness of No. 26 aluminum wire, carrying a small sinker of lead which could be removed and placed on the top of samples lighter than water. A counterweight of lead was hung from the right-hand stirrup, and final adjustment was made with the thumbscrews on the beam. A

beaker of water, filled up to an arbitrary mark, was supported over the left pan by the usual type of bridge. The balance was adjusted so that the pointer swung equal divisions on either side of the center of the scale, with the harness and sinker in water; and since the water level was kept up to the mark during all weighings, no buoyancy correction was necessary. No account was taken of errors due to surface tension, because, owing to the fine wire used in the suspension, they were small.

Determinations were made by weighing the samples first in air (W_1), then in water (W_2), and again in air (W_3), the two weighings in air being made with the harness and sinker in water. After obtaining the suspended weight, the surplus water on the surface of the samples was removed by wiping with a moist cloth, before weighing in air the second time.

TABLE I

			Weight (grams)			Apparent Density	
Sample		Dimensions (cm.)	In Air (W_1)	In Water (W_2)	In Air (W_3)	$\frac{W}{V}$	$\frac{W_1}{W_3-W_2}$
Carbon	1	1.80x2.85x0.62	4.9060	2.2918	5.3966	1.54	1.58
	2	3.14x1.81x0.62	5.6058	2.4921	6.0500	1.59	1.57
	3	1.92x2.52x0.62	4.6528	2.1876	5.0776	1.55	1.61
	4	1.89x2.83x0.62	5.2894	2.4735	5.7214	1.60	1.63
	5	1.87x3.17x0.62	5.6430	2.6398	6.2210	1.54	1.58
	6	3.51x1.90x0.62	6.5626	3.0572	7.0804	1.59	1.63
	7	3.02x3.00x0.62	8.8134	4.1386	9.6720	1.57	1.59
	8	3.04x2.06x0.62	6.1576	2.8608	6.6338	1.59	1.63
	9	3.11x2.99x0.62	9.2110	4.3278	9.9306	1.60	1.64
	10	2.89x2.89x0.62	8.4206	3.9442	9.1932	1.63	1.60
Coke	1	1.85x1.45x1.38	3.7206	0.2840	3.8290	1.05	1.05
	2	1.86x2.06x1.45	5.2492	0.2063	5.4338	0.95	1.00
	3	1.04x2.21x2.66	5.4050	0.1674	6.4720	0.89	0.86
	4	1.05x1.39x2.01	2.9180	0.2613	3.0846	1.00	1.03
	5	1.09x2.20x2.19	5.0045	0.4600	5.5386	0.95	0.98

Comparative results obtained with regularly shaped pieces of carbon (cut from a resistor plate of the sort used for resistance electric furnaces) and coke (cut from ordinary metallurgical coke) are shown in Table I.

The agreement between the two sets of values is satisfactory.

TABLE II

		Weight (grams)					Apparent Density	
		In Air	In Water (W_2)		In Air (W_3)			
	Sample	(W_1)	*a*	*b*	*a*	*b*	*a*	*b*
Coke	6	4.0466	1.2872	1.800	4.2636	4.7846	1.36	1.36
Coke	7	3.4936	0.2526	1.5370	3.6740	4.9270	1.02	1.03
Coke	8	5.2942	1.7168	2.3540	5.6944	6.3000	1.33	1.34
Coke	9	2.9226	0.0368	1.2952	3.1855	4.4336	0.93	0.93
Coke	10	4.4029	1.3124	1.9553	4.6426	5.2800	1.32	1.32
Silica brick	1	6.6290	3.5186	3.7782	7.5544	7.8232	1.64	1.64
Silica brick	2	7.1416	3.8084	4.0600	8.1243	8.4144	1.65	1.64
Magnesite brick	1	11.3028	7.9252	8.0678	12.3688	12.5056	2.54	2.54
Magnesite brick	2	8.7256	6.1521	6.1910	9.5326	9.6304	2.58	2.54
Bauxite brick	1	8.4012	4.0490	5.3871	8.3799	9.8200	1.94	1.90
Bauxite brick	2	8.2897	3.9452	5.3618	8.3170	9.7442	1.90	1.89
Common brick	1	7.0477	4.1248	4.3152	7.6772	7.9417	1.98	1.94
Common brick	2	6.8638	3.6864	4.1917	7.1132	7.5900	2.00	2.02
Chromite brick	1	8.6657	6.4140	6.4343	9.2000	9.2630	3.11	3.06
Chromite brick	2	11.0750	7.4008	7.4951	10.6522	10.7374	3.41	3.42

Columns *a* contain the figures obtained by the simple water displacement method; columns *b* by boiling under reduced pressure.

Table II shows the results obtained by the simple water suspension method, and by boiling under reduced pressure for 1 hour, on irregularly shaped samples of coke and refractory bricks. In taking the brick samples, the smooth face of the brick was chipped off, so that none of the samples had any part of the original surface. Two samples were taken from each type of refractory.

Here the agreement is better than in Table I.

In all the weighings tabulated, the damping effect of the harness was very pronounced, particularly on the lighter samples, but the balance was nevertheless sensitive to the rider at all loads encountered. In some cases water was absorbed with sufficient rapidity that the suspended weight of the sample gradually increased, causing some doubt as to the correct reading, but in all such instances the weight became constant in 10 minutes or less.

In conclusion, the results reported in this paper indicate that the simple water displacement of determining apparent densities is simpler, much more rapid and fully as accurate as the method of boiling under reduced pressure.

The author is indebted to J. L. Crawford, of the Mellon Institute, University of Pittsburgh, for his kindness in reading the proof of this article.

Use of Gas Masks Explained

Increasing Use of Various Types of Apparatus, Hose, Self-Contained Oxygen and Regular Gas Receive Attention

The widespread use to which various types of gas masks and breathing apparatus are being put in the industries, and the fact that lives have been lost on account of the improper use of such devices, have led the Department of the Interior to conduct an investigation of the matter at the Pittsburgh experiment station of the Bureau of Mines.

Three types of respiratory apparatus—gas masks, hose masks, and self-contained oxygen-breathing apparatus—are now commonly used for protection from noxious gases, vapors, and smokes or mist.

Gas masks are the simplest and easiest to wear, also the least cumbersome, but they protect only in comparatively low concentrations of noxious gases and should never be used where the air contains less than 16 per cent of oxygen. It is essential to know the concentrations of gases to be removed in using this type.

Hose masks protect in any irrespirable atmosphere, but are somewhat cumbersome, the length of hose limiting the distance a wearer may go from fresh air. They are serviceable also where a supply of pure air moves with the wearer, as where a locomotive engineer in a smoky tunnel is using a hose mask supplied with air from the compressed air line of the locomotive. Hose masks consume no chemicals or materials and so are not limited in the time they may be used.

Self-contained oxygen-breathing apparatus protect in any irrespirable atmosphere, but their weight is cumbersome, they can be used only by trained men, and frequent attention must be given them to maintain good working condition. On the other hand they are the only safe means for exploring mines and other places filled with irrespirable gases in high concentrations.

Gas masks are divided by the Bureau of Mines into four classes—for organic vapor; for acid gases; for ammonia; and for carbon monoxide. In general, masks for any one type of gas can not be substituted for those of another, therefore care must be exercised in using the proper canister and men likely to be called upon to wear masks should be informed of these facts.

Gas masks do not protect against deficiencies of oxygen, since they are dependent on the air surrounding the wearer. Oxygen-breathing apparatus protect against all deficiencies of oxygen, hence are vitally important in exploring and rescue operations in mines after explosions and fires.

Hose masks and oxygen-breathing apparatus protect against any concentration of organic vapors, such as aniline, benzene, ether, toluene, and gasoline.

Machinery
and Appliances
for Production and Control

Equipment News

From Maker and User

Materials
and Accessories
for Chemical Industries

Ljungstrom Air Preheater

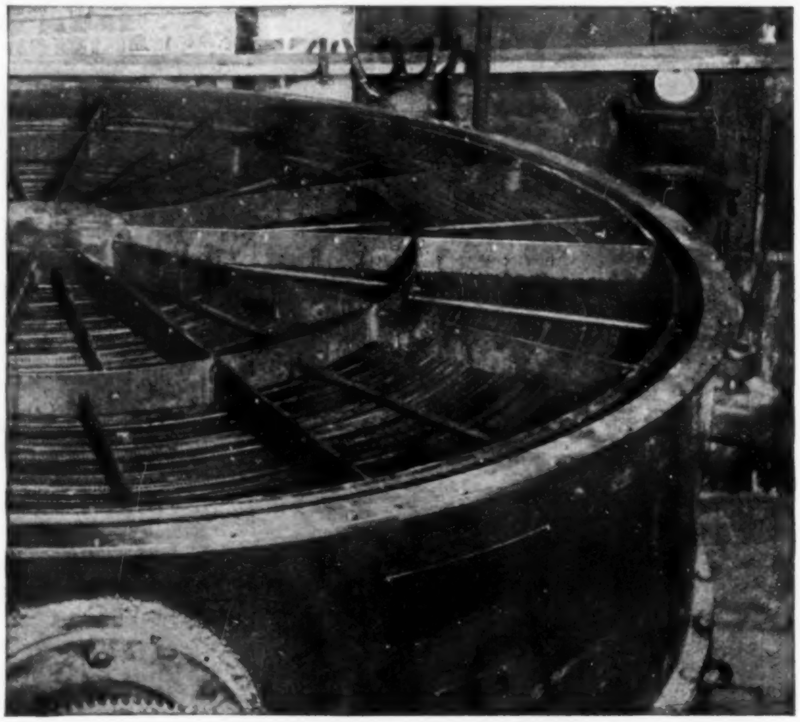

FIG. 2—VIEW OF THE ROTOR SHOWING ITS DESIGN

A great source of loss in connection with steam boiler and furnace operation is the quantity of heat carried away to waste by the flue gases. The days have long passed in which a high exit temperature of the gases was tolerated for the sake of producing natural draught and economizers are now fitted in boiler plants of any size in order to utilize as far as possible the heat which the boiler itself cannot extract from the gases. The close regulation of the excess air supplied to the fires which is rendered possible by the use of CO_2 recorders has had its natural effect in increasing the temperature of the exit gases, and this again has called attention to the amount of recoverable heat which these gases contain. In addition to extracting a part of this heat by means of economizers, or indeed as an alternative to the use of economizers, it has often been proposed to use the heat of the waste gases to raise the temperature of the air supplied to the fires.

The practical benefits of doing this are claimed to be greater than one would deduce from simple arithmetical calculations. The advantage does not stop with the mere return of so many heat units per hour to the furnace. The hotter air supply naturally increases the furnace temperature, and consequently increases the rate of radiant heat transmission to the boiler in a much greater ratio. This increased rate of heat transmission also has the effect of reducing the flue gases leaving the boiler to a temperature actually lower than they would have been had the furnace been supplied with colder air.

The proper solution of this problem has been receiving the attention of engineers for years, since with the resulting advantages so fully understood, it has been generally appreciated how far reaching would be any invention along the lines desired which would permit of ready application, be reasonable in first cost and also be simple and reliable in operation.

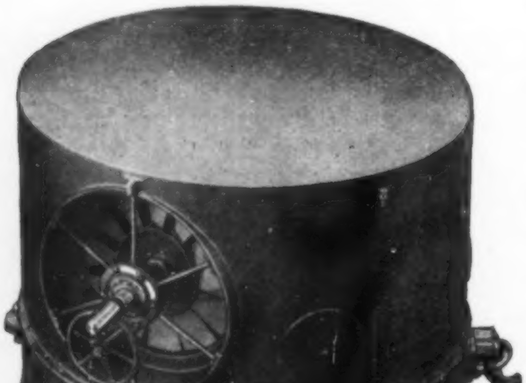

FIG. 1—OUTSIDE VIEW OF LJUNGSTROM AIR PREHEATER

Up to the present there are two ways by which it has generally been attempted to raise the temperature of air for combustion. In steel works furnaces a common practice is to pass the fresh air and the flue gases alternately through regenerating chambers, so that the incoming air picks up heat from the brickwork previously raised to a high temperature from the passage of the flue gases. For boiler furnaces the flue gas temperature is not sufficiently high to make this plan practicable, quite apart from the difficulty of carrying it out. Hence when regeneration has been applied to steam boiler plants it has been customary to tranmit the heat from the waste gases to the incoming air, through metallic surfaces separating the air passages from the flues. Heat transmission under such circumstances is not very effective, as the temperature difference is not great and the surfaces of the heating device are prone to become covered with a layer of soot or tarry matter which acts as a non-conductor.

The third solution is in the form of

the air preheater which has been designed by Frederick Ljungstrom of Stockholm, Sweden. This air preheater, of which an external view is shown in Fig. 1, is unique in that it embodies neither of the principles referred to above, but carries heat continually in a mechanical way from the flue gases to the incoming air. It will further be observed that the apparatus is so designed as to be compact, simple in operation and to permit ready application either to existing plants or new installations.

Fresh air is drawn by a fan into the upper portion of the casing, which is divided into two parts by a vertical partition. The air is confined to one side of the partition and passes downward to a similar semi-circular chamber, through the body of a porous cylindrical drum or rotor. The flue gases from the boiler traverse the apparatus in the reverse way, entering the lower semi-circular chamber and passing upward through the rotor to the upper chamber, whence they are exhausted and impelled to the stack by another fan. The integral fans are carried on a common shaft and the required speed of the rotor—about 6 r.p.m.—is obtained by means of suitable gearing connecting the fan shaft with the driving roller. The rotor is kept in a state of continual slow rotation so that the part heated by the flue gases is continually passing to the other side of the device and gives up its heat to the cold air sweeping through it. Similarly, of course, the cooled part of the rotor is continually returning to be reheated by the flue gases.

It will be observed that there is no transference of heat through metal in the process. A deposit of soot or tarry matter does not therefore have any very serious effect upon the action of the apparatus, which moreover may be cleaned in a few moments by means of a steam jet. This latter blows the soot along with the air going to the furnace so that what heat value it has is returned to the fire.

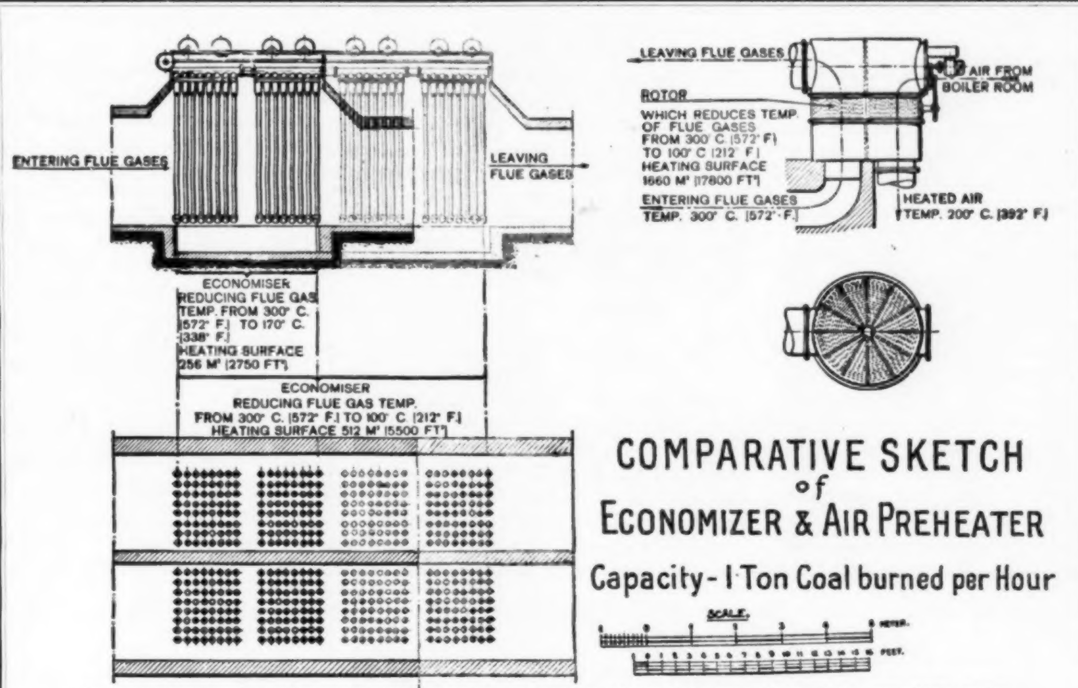

FIG. 3—SKETCH SHOWING SIZE RELATION OF ECONOMIZER AND AIR PREHEATER

The rotor which is illustrated separately in Fig. 2 is built of thin sheet steel and divided into sections by radial plates, which serve as stiffening spokes. In each section the heating elements are placed concentrically. These consist of specially corrugated plates alternating with plain, thus forming, when assembled, a great number of passages and resembling a honeycomb structure. This design allows a liberal heating surface to be provided in a heater of comparatively small dimensions with little obstruction to the passage of the gases and air.

On the outside of the rotor a heavy steel ring is fastened, against which the carrying and guide rollers work. As the rollers carrying the weight of the rotor are mounted on ball bearings the amount of power required for driving purposes is small.

It is claimed that as an alternative to an economizer, the Ljungstrom air preheater is not only more efficient but is somewhat lighter and less expensive in first cost and maintenance. Fig. 3 shows an air preheater, as compared to an economizer of standard design. In both cases it has been assumed that the temperature of the flue gases leaving the boiler is 572 deg. F. The air preheater cools the flue gases down to about 212 deg. F., thus absorbing the heat between these limits, which, according to tests, results in a saving of fuel of 20.1 per cent. The weight of the heating elements is 7,100 lb.

If it were possible for the economizer to absorb the same amount of heat, its dimensions would become those shown in full drawn plus shaded lines. In practice, however, its dimensions would actually be as shown by the full lines alone, with the result that the flue gas temperature would be reduced to only about 338 deg. F., the calculated saving in fuel would be 8.6 per cent, and the total weight of tubes would approximate 44,000 lb.

The maker of the Ljungstrom air preheater in America is James Howden & Co. of America, Inc., Wellsville, N. Y.

Review of Recent Patents

Applying Centrifugal Separation in the Oil Industries

Four Recent Patents Claim Improvements in the Refining of Both Vegetable and Mineral Oils—Particularly in Resolving Crude Emulsions

CENTRIFUGAL separation finds one of its best-known applications in the petroleum industry. In the oil fields it is perhaps the most successful method of breaking emulsions and recovering crude oil from bottom settlings ("b.s."). And in the refinery the centrifugal is an essential factor in the production of "bright stock" and neutral lubricating oils. The application in vegetable oil refining, however, is a less-known development.

C. H. Hapgood and G. F. Mayno of the De Laval Separator Co. have recently been granted an interesting patent for a purification process applicable to cottonseed oil. It is claimed that in addition to being a continuous process, it effectively reduces the amount of oil that is carried into the soap stock and by making possible treatment at a lower temperature, the production of emulsion is minimized. The temperature range is 80 to 100 deg. F., as compared with the customary 140 deg.

The oil and the alkali are subjected to mechanical agitation in a mixer for about 15 minutes in order to effect a preliminary saponification of the fatty acids. The mixture then passes to the centrifugal separator, where it receives further admixing, which, although of short duration, is particularly effective. The heavy alkali and soap stock are forced to the periphery and discharged, while the lighter oil is displaced inwardly and "floated" off through an upper discharge. The oil is practically free of soap and it is necessary only to give it the customary treatment with fullers earth and filter pressing to obtain the refined product. (1,457,072, issued May 29, 1923.)

Resolving Emulsions

The stability of emulsions usually depends upon the properties of the emulsifying colloids. Thus it is known that if an emulsifying colloid of an opposite character to the emulsifying colloid in the emulsion be put in contact with it, the stability of the emulsion will be reduced or destroyed. If both hydrophobes (water-in-oil) and hydrophiles (oil-in-water) are present in an emulsion, it will take the form of the predominating colloid. It is common practice to add sodium soap (a hydrophile) to a water-in-oil emulsion to break it. In practice the amount of such counter-colloid added is less than that required to reverse the emulsion and merely enough to reduce its stability so that the globules of water may be separated by gravity or centrifugal force. An example of breaking the opposite type of emulsion is found in the case of the addition of calcium soap (hydrophobe) to an oil-in-water emulsion.

Eugene E. Ayres, Jr. assignor to the Sharples Specialty Co., has been granted a patent for an improved method of introducing these corrective colloids. He is able to prepare reagents that will disperse as colloids in the continuous phase and yet act as emulsifying colloids soluble in or wetted by the dispersed phase. In other words, he produces an effect of oil-soluble hydrophiles and water soluble hydrophobes. A reagent consisting of 25 per cent of sodium soap, 10 per cent of water and 65 per cent of oleic acid has been found to give excellent results. Another has the composition of 4 per cent of calcium oleate dissolved in a mixture of 50 per cent alcohol and 50 per cent glycerine with 1 per cent of gelatine added as a stabilizer. (1,454,616, issued May 8, 1923.)

Preventing Formation of Emulsions

A particular example of the application of this principle is described in a second patent (1,454,617) by Mr. Ayres, in which the process is used for

American Patents Issued August 7, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,463,782—Process of Recovering Condensable Vapors From Gases. H. H. Armstrong, Los Angeles, Calif., assignor to Armstrong Co., Los Angeles.

1,463,793 — Manufacture of Artificial Silk. E. Bronnert, Mulhouse, France.

1,463,794—Acceleration of Vulcanization and Products Obtained Thereby. S. M. Cadwell, Leonia, N. J., assignor to Naugatuck Chemical Co.

1,463,818—Apparatus for Feeding Sulphur Dioxide or Other Materials in a Fluid or Gaseous Condition. C. W. Hottmann, Philadelphia, Pa.

1,463 887 — Barking Apparatus. H. Guettler, Escanaba, Mich., assignor by mesne assignments, to Fiber Making Processes, Chicago, Ill.

1,463,913 — Process of Dehydrating Gypsum. F. B. Stuart and C. A. Rivers, El Paso, Tex.

1,463,959—Process for Oxidizing Phosphorus. B. G. Klugh, Anniston, Ala., assignor to Federal Phosphorus Co., Birmingham, Ala.

1,463,980—Explosive and Method of Producing the Same. W. B. Sturgis, Joplin, Mo., assignor to General Explosives Co., Chicago, Ill.

1,463,999 — Artificial Refrigerating Unit. C. M. Holley, Detroit, Mich., assignor to Utility Compressor Co., Detroit.

1,464,044—Preserved Wood and Process of Making Same. R. A. Marr, Jr., Norfolk, Va., assignor of one-half to R. A. Marr, Norfolk.

1,464,124—Thermionically Active Substance and Method of Making the Same. W. Wilson, East Orange, N. J., assignor to Western Electric Co., New York.

1,464,137—Process of Treating Sulphur Chloride. J. V. Meigs, Montclair, N. J., assignor to New Jersey Testing Laboratories.

1,464,143 — Preparation for Treating Articles of Rubber. J. B. G. Taber, New Haven, Conn.

1,464,149—Process for the Production of Glossy-Metal Coatings on Metals. A. Classen, Aachen, Germany.

1,464,152—Process of Utilizing Gaseous Unsaturated Hydrocarbons. C. Ellis, Montclair, N. J.

1,464,224—Varnish, Paint or Waterproofing Composition and Process for Making Same. P. M. Stewart, Pasadena, Calif.

1,464,246—Distilling Apparatus. N. H. Freeman, Holborn, London, England.

1,464,253—Method of and Structure for Utilizing Superheated Liquid Fuels. N. B. Wales, New York.

1,464.291 — Apparatus for Treating Liquids with Chemical Reagents. W. Paterson, London, England.

1,464,292—Process of Producing Boron Nitride. S. Peacock, Wheeling, W. Va., assignor to W. G. Waldo, Washington.

1,464,296—Fluid Pump. G. A. Sacchi, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Co.

1,464,310—Sizing Solution and Method of Making the Same. J. A. De Cew, New York, assignor to Process Engineers, Inc., New York.

1,464,319—Device for Supplying Oxygen. P. H. Sudende, near Berlin, Germany.

1,464,323-5 — Drying Apparatus for Lumber. C. Lazier, Belleville, Canada, assignor, by mesne assignments, to Natural Air Dryers, Inc.

1,464,373—Process for the Regeneration of Anhydrous Aluminum Chloride. G. R. Steuart, Denver, Colo., assignor of one-third to A. H. Hirsig and one-third to W. C. Hollister.

1,464,416—Liquid-Discharge Means in Bowls of Centrifugal Separators. E. A. Forsberg, Stockholm, Sweden, assignor to Aktiebolaget Separator, Stockholm, Sweden.

1,464,480—Pitch Cement and Process for Making the Same. G. A. Henderson, Charleston, and R. G. Erwin, St. Albans, W. Va.

1,464,481 — Bituminous Mastic and Process for Making and Applying the Same. G. A. Henderson, Charleston, W. Va.

1,464,482—Bituminous Concrete. G. A. Henderson, Charleston, W. Va.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

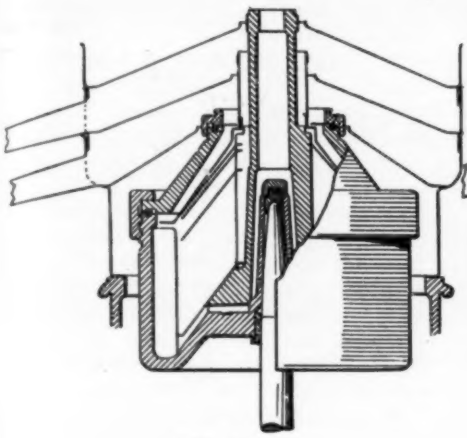

FIG. 1

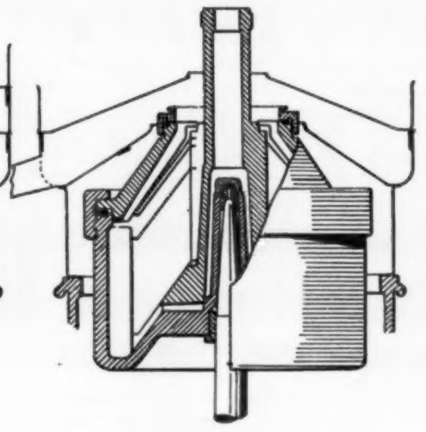

FIG. 2

preventing the formation of emulsions of water-in-oil such as are produced by the seepage of water into an oil tank. Or the formation of an emulsion of oil-in-water in the water washing of alkaline oils by percolation might be prevented similarly. As an example, if 1 per cent of a reagent consisting of about 25 per cent of rosin soap, 35 per cent of free rosin and 40 per cent of water is dissolved in fuel oil and the fuel oil is agitated with fresh or salt water, the formation of emulsions of water-in-oil is either prevented or the emulsion formed because of the agitation is readily settled by gravity. In the water washing of lubricating oils after acid and alkali treatment, the addition of an aqueous suspension of iron oleate is claimed to prevent to a large extent the emulsification of oil in the wash water. It is pointed out that many other reagents are suitable for the prevention of oil-in-water emulsions—the only requirements being that the reagent should be colloidally soluble in water and yet contain a hydrophobe colloid.

Purifying Switch Oils

The mineral oil in which electric switches are immersed in order to prevent arcing offers some serious problems of purification and dehydration. The colloidal carbon formed as the oil breaks down, together with the natural accumulation of dirt and water, soon seriously reduces the dielectric strength of the oil. None of the impurities can be separated wholly by gravity, nor is ordinary centrifugation effective in reducing the proportion of water to the absolute degree required. Usually, therefore, a filter press comprising approximately 1,000 sheets of blotting paper is used in the final stage of purification.

A two-step centrifugal process, which has recently been patented by C. H. Hapgood and assigned to the De Laval Separator Co., first makes use of the counter-colloid principle to effect a preliminary purification by removing the colloidal carbon and a portion of the water. For this purpose there is added to 100 lb. of the oil 3 lb. of a readily saponifiable oil (such as red oil) and sufficient alkaline solution to saponify the oil completely and to form the counter-colloid of soap. A suitable salt (about 1½ lb. of NaCl or Na_2SO_4) is added to facilitate separation and prevent the formation of an emulsion. Centrifugal force is then applied, preferably in a centrifugal separator of the Snyder type (U. S. Pat. 1,283,343). The oil, now free from carbon and dirt, is substantially dehydrated, but it is again subjected to centrifugal force under conditions that will insure the removal of most of the remaining water. This final separation can be carried out in any centrifugal separator, whether of the multiple disk or open bowl type. It has been found most economical, however, to use the same separator for both centrifuging steps and leave open the discharge for the heavier liquids and solids in the first step and seal the discharge in the last step. Fig. 1 is a vertical section through the bowl of such a separator when adapted to function as a separator or purifier. Fig. 2 shows the same machine adapted to function as a clarifier. (1,460,718, issued July 3, 1923.)

In the first centrifugal step of the process, when carried out in the purifier of Fig. 1, a mixture of soap solution and carbon flows out around the lower edge of the top disk, fills the conduit above the top disk and discharges over the neck of the bowl. The lighter liquid, containing a very small percentage of heavier liquid, mostly water, is displaced inward, flows upward inside the neck of the top disk,

Important Articles in Current Literature

More than fifty industrial. technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

DEVELOPMENTS IN THE CEMENT INDUSTRY. Rex Furness. An account of the advances made in control of production of calcium aluminate cements, with consideration of production methods, costs, supply of raw materials and recovery of waste heat. *Chemistry & Industry*, July 27, 1923, pp. 728-731.

EXPLOSIVE TENDENCIES OF PULVERIZED COAL. Hartland Seymour. A discussion of the hazards arising in connection with the utilization of pulverized fuel in the light of best modern practice. *Chemical Age* (London), July 28, 1923, pp. 82-84.

ALCOHOL, THE MOTOR FUEL OF THE FUTURE. Captain C. C. Green. A description of sources and manufacture of alcohol, with a tabulated comparison of the characteristics of alcohol, petrol and benzol, including deductions drawn therefrom. Results from practical experience in the use of an alcohol fuel are included. *Chemical Age* (London), July 28, 1923. pp. 84-85.

GEORGIA CLAYS FOR PAPER FILLERS. W. W. Weigel, Mineral Technologist, Bureau of Mines. Summary of study made on the suitability of Georgia clays for paper making, with the conclusion that these clays, properly washed and prepared, are in many cases superior to imported clays. *Paper Trade Journal*, Aug. 9, 1923, pp. 51-54.

BENZOL RECTIFICATION PLANT FOR SMALL UNDERTAKINGS. Anon. Description of a plant for making motor fuel and other products from a supply of 1.000 gal. or less per day of crude benzol. *Iron and Coal Trades Review*, July 27, 1923, pp. 118-119.

EXPERIENCES OF COKE RECOVERY BY THE COLUMBUS PROCESS. Anon. Discussion of the recovery of coke from ash, clinker, etc., such as constitute the waste at coal-gas and carburetted water-gas plants. *Gas Journal* (London), July 18, 1923, p. 310.

GASEOUS COMBUSTION AT HIGH PRESSURES. William A. Bone. First section of an extended discourse before the Royal Institution of Great Britain on experimental researches of this well-known investigator. *Gas Journal* (London), July 25, 1923, pp. 363-5.

MAINTENANCE AND REBUILDING OF ROUND DOWN-DRAFT KILNS. E. E. Ayars. How rebuilding a kiln saved $800 in fuel consumption in 8 days in burning time on silica brick. *Brick & Clay Record*, Aug. 7, 1923, pp. 181-185.

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SUITABILITY OF THE TUNNEL KILN FOR BURNING REFRACTORIES. A. F. Greaves-Walker and S. M. Kier. Report by the committee on fuel conservation on tunnel kilns of the Refractories Manufacturers Association, expressing the opinion that fireclay and silica refractories can be burned successfully in this type of kiln with an average fuel saving of at least 75 per cent. *Journal American Ceramic Society*, August, 1923, pp. 891-895.

SILICA CEMENT. E. N. McGee. Composition, requirements and specifications for first quality silica cement. Study of bonding qualities showed that use of molasses greatly improved bond without affecting refractoriness. *Journal American Ceramic Society*, August, 1923, pp. 896-903.

DISINTEGRATION OF REFRACTORY BRICK BY CARBON MONOXIDE. B. M. O'Harra and W. J. Darby. Ordinary firebrick and magnesite brick are rapidly disintegrated in an atmosphere of CO at temperatures favorable for its decomposition into C and O_2, but iron-free firebrick, silica brick, carborundum brick or chrome brick (low in free iron oxide) are not affected. *Journal American Ceramic Society*, August, 1923, pp. 904-914.

and then is immediately discharged over the neck.

In the final step of the process, when carried out in the clarifier of Fig. 2, there is fed into the bowl the contaminated oil that has been separated out in the preceding step of the process. The small proportion of soapy water present is thrown to the periphery of the clarifier, where it accumulates and forms an envelope of gradually increasing thickness. The lighter liquid is continuously discharged over the weir. This lighter liquid is the practically pure oil which it is the object of the process to secure.

Men in the Profession

F. H. ARMSTRONG, for the past 19 years chief engineer and executive of the Penn Mines Co., Norway, Mich., has resigned.

HOWARD E. BATSFORD is now field engineer with the Utica Gas & Electric Co., Utica, N. Y., in charge of ordering material and constructing substations.

Dr. V. L. BOHNSON resigned as assistant professor of chemistry at the University of Wisconsin, to join the staff of the Oldbury Electrochemical Co., Niagara Falls, N. Y.

H. D. CALLAHAN of Columbus is now with the Northwestern Terra Cotta Co., Chicago, Ill.

EDWIN S. CAVETT, who was formerly connected with the American Oak Leather Co., Cincinnati, Ohio, as assistant chemist, is now with E. C. Smoot & Sons, North Wilkesboro, N. C., doing research on the tanning of sole leather.

DAN DAHLE, formerly chief chemist with the Wilckes, Martin, Wilckes Co., Camden, N. J., is now research chemist with the Phosphate Mining Co., Nichols, Fla.

JAMES J. DALE of Trenton, N. J., has resigned as secretary of the Sanitary Potters' Association on account of ill health. Mr. Dale is 79 years of age and has handled the secretaryship of the organization for many years.

FRANCIS B. DAVIS has been made general manager of the du Pont Co.'s pyralin department. He succeeds R. M. Carpenter, who was called in to take over the work last February, when C. W. Phellis, the general manager at that time, resigned. Mr. Davis, who had been in former years a du Pont employee and had been transferred to the General Motors Corporation, was called back to become Mr. Carpenter's assistant. R. W. Brokaw has been advanced to the position of assistant general manager, made vacant by Mr. Davis' promotion.

J. B. DAVIS has been promoted to plant manager of the converting factory of the Standard Textile Products Co., Buchanan, N. Y.

WALTER B. ELCOCK, formerly district manager of the Portland Cement Association of Chicago, Ill., has been appointed assistant general manager of the organization, in charge of the Southeastern offices, with headquarters in Atlanta, Ga.

WILLIAM J. HIGHFIELD, of Wilmington, Del., has been elected president of the Assateague Fish Oil & Fertilizer Co., Inc., Chincoteague, Va.

J. S. NEGRU, formerly managing editor of *Chem. & Met.*, is now editor of *La Revue Universelle des Mines*, at Liége, Belgium.

EDGAR W. HUNTLEY of Lead, S. D., has recently been made chief chemist at the plant of the Horlick's Malted Milk Co., Racine, Wis.

Dr. ARTHUR A. NOYES, director of the Gates Chemical Laboratory of the California Institute of Technology, has been elected an Honorary Fellow of the Royal Society of Edinburgh, which was founded in 1783 and is incorporated by royal charter. There are fifty-seven Honorary Fellows of the Society, seven of whom are Americans, including Dr. Noyes, William Wallace Campbell, president of the University of California and former director of the Lick Observatory; George Ellery Hale, director of the Mt. Wilson Observatory; Douglas H. Campbell, professor of botany, Stanford University, and Albert A. Michelson, Nobel laureate, 1907, professor of physics at the University of Chicago and research associate of the Mt. Wilson Observatory and the California Institute of Technology.

B. S. RADCLIFFE has left the St. Louis Terra Cotta Co. and is now with the Northwestern Terra Cotta Co., Chicago Ill.

ISIDORE SCHUB, formerly chief chemist of the Yale Electric Corporation, Brooklyn, N. Y., is now chief chemist of the Diamond Electric Specialties Corp., Newark, N. J.

R. NORRIS SHREVE, W. SCHMIDTMANN and W. P. TENEYCK recently organized the Ammonite Co. in New York for the manufacture of ammonium salts.

W. C. WELTMAN is now first assistant chemist for the St. Louis, San Francisco R.R. Co., with headquarters in Springfield, Mo. Mr. Weltman was formerly chemist for the State of Illinois.

A. G. WIKOFF, assistant editor of *Chem. & Met.*, who has been in Chicago for nearly a year and a half, has returned to the New York office.

HAROLD G. WOLFRAM, who has been studying ceramics at the University of Illinois, is now with the Bureau of Standards, Washington, D. C.

Obituary

WILLIS F. McCOOK, founder and president of the Pittsburgh Steel Co., Pittsburgh, Pa., died on Aug. 5, as a result of an operation. He was born at Lisbon, Ohio, and was at one time associated with the Frick Coke Co.

Dr. MICHAEL P. C. POTVLIET, chief chemist of the Dominion Sugar Co., passed away suddenly on Aug. 3. Apoplexy is believed to have been the cause of his death. The late chemist was born in Amsterdam, Holland, in 1866, and was a graduate of the University of Amsterdam with the degree of Doctor of Philosophy. He came to America in 1910 and had been connected with some of the leading sugar companies. He was a Fellow of the Canadian Institute of Chemistry.

HENRY WATKIN, for the past 40 years connected with Macintyre & Co., Ltd., Burslem, England, manufacturer of electrical porcelain products, and a director of that organization, died recently at his residence at Porthill, England. He was one of the leaders in the English pottery industry and was instrumental in the founding of the pottery school at Stokeon-Trent.

Calendar of Coming Events

AMERICAN CHEMICAL SOCIETY, fall meeting, Milwaukee, Wis., Sept. 10 to 14.

AMERICAN ELECTROCHEMICAL SOCIETY, forty-fourth meeting, Dayton, Ohio, Sept. 27 to 29.

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, winter meeting, Washington, D. C., Dec. 5 to 8.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, INC., Ontario and Quebec, Aug. 20 to 31.

AMERICAN MANAGEMENT ASSOCIATION, Hotel Astor, New York, Oct. 29-31.

AMERICAN MINING CONGRESS, Milwaukee, Wis., Sept. 24 to 27.

AMERICAN SOCIETY FOR STEEL TREATING AND INTERNATIONAL STEEL EXPOSITION, Motor Square Garden, Pittsburgh, Pa., Oct. 8 to 13.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, annual meeting, New York City, Dec. 3 to 6.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, annual convention, New York City, Dec. 3 to 5.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS, iron and steel exposition, Buffalo, N. Y., Sept. 24 to 28.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATION ENGINEERS, fourteenth annual convention, Memphis, Tenn., Dec. 12 to 16.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH), New York, Sept. 17 to 22.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York, Dec. 3 to 8.

NATIONAL SAFETY COUNCIL, twelfth annual safety convention, Statler Hotel, Buffalo, Oct. 1 to 5.

Industry and Trade

Current News and Market Developments

Summary of the Week

Arguments for changes in duty on casein presented at first public hearing granted by Tariff Commission.

Tariff investigations ordered into production costs of aminol salts and magnesite.

Maximum price suggested for British dyestuffs, but makers oppose.

Standards of strengths for dyes according to which import duties will be levied have been established.

State of Georgia places contract for 20,000,000 lb. of calcium arsenate to be delivered annually for the next 5 years.

Royal Commission appointed in Canada to investigate pulpwood situation.

Dayton meeting of American Electrochemical Society includes many technical features.

Government sues Nashville Industrial Corporation.

No Chemical Exposition will be held in 1924, in accordance with a vote of the exhibitors.

A.C.S. plans for Milwaukee meeting in September nearly complete.

Western railroad lines work to equalize rail and water rates to Pacific Coast points.

Duty on Casein Discussed at Public Hearing of Tariff Commission

Present Duty Alleged to Have Curtailed Consumption of Coated Paper—Milk Producers Assert Heavy Imports of Casein Depress the Market

A PUBLIC HEARNG on the application filed by a committee of coated paper manufacturers for a reduction in the import duty on casein under the terms of the flexible tariff was held before the Tariff Commission Aug. 13 and 14, developing into the most spirited contest that has marked any of the hearings thus far conducted under this new provision of the tariff law.

Arguments for Reduction

Coated paper manufacturers, represented by Martin Cantine, of Saugerties, N. Y., asserted that the duty of 2½c. a pound imposed by the 1922 tariff act had increased the cost of casein by the full amount of the duty or more on the imported product. Mr. Cantine asserted that it had been impossible for the paper manufacturers to pass on this increased price to their consumers and that as they were financially unable to absorb the duty in full the consequence had been a decrease in consumption of their paper, publications turning to cheaper grades of paper, until mills now are operating at only about 60 per cent of capacity. The witness contended that imported casein is of a more uniform quality and cleaner generally than the domestic product and hence always has commanded a differential of about 1c. a pound above the price of domestic casein.

Figures were introduced showing wide fluctuations in the price of casein, which during the years 1911-1915, inclusive, averaged slightly above 9c. per pound, c.i.f. New York, for the imported, with domestic slightly lower. A slight increase in price marked the succeeding years until 1922, by which time the imported casein had dropped to 8½c. a pound. During that year, however, a heavy demand was felt and the price rose to as high as 36c. a pound. Mr. Cantine testified that the reported imposition of a tariff duty, which later in the year became a fact, caused active bidding. Other testimony was that the uses of casein in making glue and for wood-work purposes had caused the increase in demand and that the law of supply and demand caused the increase in price.

Domestic Casein Supply Uncertain

Lawrence Ottinger, representing the National Veneer and Panel Association and president of the United States Plywood Co., testified that the supply of domestic casein is uncertain and that the quality varies so widely that the foreign product is preferred by glue makers. H. L. Derby, representing the Kalbfleish Corporation, distributor of casein and manufacturer of chemicals used in the coated paper industry, testified that the principal trouble with the domestic product is its uncertain volume, although a lack of quality in the casein produced by some of the creameries in the United States serves to depress the general price of the domestic product, he said. Mr. Derby pointed out that many creameries in this country produce casein only when there is an oversupply of cheese or of powdered milk, as these products were more profitable than turning the skimmed milk to casein. It was pointed out that it requires 100 lb. of milk to make 3 lb. of casein.

Opposition From Agriculturists

The opposition to the application was directed by the National Milk Producers' Federation. This is the first case in the hearing stage under the flexible tariff which has affected the agricultural interests of the country. Witnesses for the opponents of the application testified that the costs of producing milk had increased materially in the United States in the last year. The casein industry has not been able to gain a sound foothold in the United States, representatives of the dairymen testified, because of the heavy volume of imports, which has depressed the market. Under the protective tariff, it was contended, the domestic industry could be placed on a stable basis, both as to quality and as to quantity. Among witnesses introduced by the opponents were Prof. E. S. Savage, of the College of Agriculture of Cornell University; W. H. Bronson, of the New England Dairymen's Association; Clarence E. Sniffen, and N. R. McKinley, of the Dairymen's League Cooperative Association, New York, and others.

Maximum requirements of casein in this country were stated to be 44,000,000 lb. Maximum production was 12,000,000 lb. in 1921 and the maximum imports were 17,000,000 lb. in 1919. Final argument in the case was set for Sept. 25.

British Manufacturers Oppose Maximum Price for Dyestuffs

Consumers Suggest Maximum of 200 Per Cent Over Pre-War Prices —Producers Hold This Would Not Help the Industry

IN REPLY to the suggestion of the Colour Users' Association that dyestuffs be sold at a maximum of 200 per cent over pre-war prices, the chairman of the British Dyestuffs Corporation, Ltd., has stated that this factor would be insufficient to cover the difference in costs and changed economic conditions, for it would yield "nothing toward the establishment and building up of the industry," according to a report to the Department of Commerce by H. B. Allen-Smith, assistant trade commissioner to London.

The chairman of the corporation states that the large majority of consumers of dyestuffs in Great Britain are as determined as ever to have a domestic dye-making industry as security against dependence on foreign supply. The chairman summarizes the management's view of prices in the following terms:

"Many colors can be and are being sold within the factor suggested by the Colour Users' Association. Many other colors will, with a return to normal working, automatically come within this factor limit, but there are many colors which, owing to heavy expenditure on research, works trials and the lack of technical experience, we are unable to produce at a price calculated on this basis. To sell them on these terms would mean a heavy financial loss to the corporation and an unreasonable sacrifice on the part of our shareholders."

Situation a Difficult One

This difficulty confronting the industry is an exceedingly tangled one, the trade commissioner's report points out, especially at this period of unsettled home and foreign dye trade and of competition from rapidly slumping continental exchange.

The Colour Users' Association in suggesting 200 per cent maximum over pre-war prices, argue that it is not unreasonable, since British wholesale price levels are around 161 per cent compared with 1914. The dye manufacturers say, however, that producing costs actually are inordinately higher than general wholesale prices. Using 1914 figures as a basis of 100 per cent, manufacturers claim that costs of production have increased to 233 per cent for raw materials, on a weighted average of twenty-five principal items; to 274 per cent for salaries, technical, engineering and chemical; and to 230 per cent for coal, stores, services and general charges, giving an average advance of 235 per cent. The increase over 1914 for dye makers is thus double the general wholesale price level increase, and merely to cover these three principal charges would require a minimum advance of 2.35 times pre-war dye prices.

The corporation adds yet another important factor to its case against the "maximum three-time" demand of the users' association. They say an added "allowance must be made in all dye-producing factories for the fact that plants cannot be worked as intensively as in pre-war days, so that post-war costs must be based on a production materially below available plant capacity.

This is due to widespread changes in the industry throughout the world. Whereas Germany before 1914 controlled 90 per cent of the world's production of dyestuffs, now, since the war, plants have sprung up in many new quarters, France and the United States particularly, as well as Great Britain, so that no one nation can expect in future to hold a predominant share of world's trade as did German enterprises in the past. It is estimated therefore that another 0.35 should be included in the necessary increased factor, which would bring the minimum 2.35 to 2.70 times pre-war prices to meet current manufacturing conditions in the dyestuffs industry.

Dye makers claim that their cheaper colors are already below this price factor and if all actual sales are considered the present average level is already 2.75. Under these circumstances, the manufacturers contend, the color users are offering only a maximum (and no minimum) that will yield "nothing toward the establishment and building up of the industry."

No Chemical Exposition to be Held in 1924

The Chemical Exposition will not be held in 1924, according to a recent vote taken among the exhibitors by the management. The taking of a mail vote on the question of whether the exposition should be held every year or every other year ended on July 28 and showed about 60 per cent of exhibitors voting were in favor of a biennial exposition. The vote by mail was taken by the management as a result of the meeting of exhibitors held at the Chemists' Club, New York, on July 28, at which time a vote on the question by those present resulted in a tie. It was then decided that all exhibitors should vote again by mail and that this should be considered the final decision in the matter. Following the 1923 Chemical Exposition, which will be held during the week of Sept. 17 to 22 at the Grand Central Palace, New York, the next exposition will be held in 1925 by the same management.

Nashville Industrial Situation Clears Up

Government Suit Entered With Resulting Receivership—Business to Go On as Usual

Suit has been entered by the government against the Nashville Industrial Corporation in the Federal Court of the Middle District of Tennessee asking that the contract held by that corporation with the government covering the sale of the Old Hickory Powder Plant be rescinded. The government alleges fraud in the original sale of the plant. By stipulation it was agreed that a receivership of the property would not be opposed by either side, and accordingly Judge Core appointed B. P. Morse, present manager of the Nashville Industrial Corporation, and W. P. Smith, Assistant District Attorney, joint receivers and issued instructions that the business should be carried on as usual, that sales of both realty and personalty shall be made and all activities instituted by the corporation shall continue under direction of the court.

No receivership of the Nashville Industrial Corporation was asked by the government. Both sides have stipulated that no dilatory motions will be made and that the case shall be brought before the court for decision at the earliest date possible.

The plans of industrialization of Old Hickory will continue, as it is the desire of both the government, as expressed by First Assistant Attorney-General A. T. Seymour, and the Nashville Industrial Corporation that an industrial city be made of this war expenditure. As charges have been made that there was fraud in the sale of the property, it was felt by both litigants that the question should be definitely settled in order that industrialization might proceed with absolute safety to industries intending to locate at this point.

This suit will in no way interfere with the location of the du Pont Fiber Silk Corporation as already announced. All sales contracts made by the corporation and now existing will be taken over and consummated by the receivers, who will operate as Old Hickory Powder Plant Receivers.

Allied Chemical Seeks to Set Aside Sale of Youngstown

The Allied Chemical & Dye Corporation has filed suit in the Circuit Court of Chicago to prevent distribution among stockholders by the Steel & Tube Co. of America of proceeds of the sale of Youngstown Sheet & Tube, to set aside the terms of sale, and to have a receiver appointed to function pending the litigation. The Semet Solvay Co., a subsidiary of Allied Chemical, owns 161,354 shares of Steel & Tube common stock, and the sale of latter company would result in loss of about $4 000,000 to the Allied Chemical & Dye Corporation, it is said.

Washington News

Insecticide Company Accused of Unfair Methods

The Worrell Manufacturing Co. of St. Louis, Mo., is named as respondent in a complaint recently issued by the Federal Trade Commission. The concern sells insecticides, disinfectants and sanitary appliances, and according to the commission's complaint numbers among its purchasers various departments, boards and administrative offices of state, county and municipal governments throughout the United States.

The commission alleges that in soliciting business from such purchasers respondent offers and gives premiums or gratuities to public officials whose duty it is to purchase commodities for such departments, for the purpose of influencing them in purchasing respondent's products.

The commission further alleges that the amount expended by the respondent for premiums in whole or in part is added to respondent's cost of doing business, which is ultimately paid out of public funds to the prejudice of the public interests concerned.

Change in Control of German Chemical Company

By the acquisition of a block of 6,000,000,000 marks new shares of an issue of 7,500,000,000 marks in the important chemical concern Behringwerke at Bremen, the J. D. Riedel Aktiengesellschaft, Berlin, materially strengthened its position, according to a report to the Department of Commerce from American Consul E. Verne Richardson.

The Riedel concern is one of the largest Berlin producers of drugs and pharmaceutical chemicals. The agreement between the Behringwerke and the Riedel concern was sanctioned by resolution at an extraordinary general meeting of the former held in Bremen early in July, at which three Riedel directors were elected to the Behringwerke board of directors. The chairman of the Behringwerke board also will join the Riedel directorate.

Federal Complaint Against Glue Company

The Federal Trade Commission has issued a complaint against the Johnson Process Glue Co. of New York City. In the citation the concern is charged with giving to persons having supervision over the purchase of glue and similar products, sums of money and other gratuities for the purpose of inducing such persons to recommend the purchase of respondent's products. Such gratuities, it is alleged, are given without the knowledge or consent of the employers of those accepting them, and are unfair to competitors.

Gain in Petroleum Exports

United States exports of crude petroleum during the 12 months ended June, 1923, showed an increase of 46 per cent in quantity over the preceding year, while shipment of refined oils increased 16½ per cent, according to an analysis made by the petroleum division of the Department of Commerce. All refined oils shared in the increased exports, but the largest gain was in gas and fuel oil, shipments of this classification being nearly 27 per cent above those for the preceding 12 months. Exports of paraffin wax, lubricating greases, and residuum also registered marked increases during the past 12 months. An interesting feature of the year's trade was the much larger shipments of gasoline and naphthas to France, Italy, the United Kingdom, Argentina and Australia.

Large Whale Oil Production in Norway

The whaling season in the Antarctic has closed and from reports received to date the catch of the seven Norwegian companies operating in South Shetland waters totals 183,910 bbl. of oil and of the three Norwegian companies in South Georgia waters 143,800 bbl., a total of 327,710 bbl., at an estimated value of about fifty million crowns, or at the day's exchange, about $8,000,000, reports Consul George Nicolas Ifft, Bergen, Norway, to the Department of Commerce.

Railroads Seek Lower Freight Rates

Transcontinental railroad lines have made application to the Interstate Commerce Commission for reductions in rates on through hauls from Chicago to the Pacific Coast. These reductions are sought in order to enable the roads to compete with the water routes to the coast. Among the commodities on which lower rates are asked are paper products, ammonia, sodas, magnesium sulphate and various other chemicals, soap and soap products, rosin, and aluminum products.

Russian Naphtha Export Less Than in Pre-War Years

A report from Moscow says that according to official statistics 8,580,200 poods of various naphtha products were exported from Russia during the first 6 months of the present economic year, or about 30 per cent of the pre-war export. The chief buyer was Great Britain, with Germany in second place. The export of Russian naphtha to Turkey is about half the pre-war export and to France about one-fourth.

Strength Standards for Imported Dyes

Official List Will Be Used for Purpose of Assessing Duties

The Treasury Department has promulgated a list giving standards of strengths of dyes for the purpose of assessing customs duties on imports of coal-tar products under the terms of paragraph 28 of the 1922 tariff act. A tentative list was issued early in May for the purpose of criticism and suggestions and the official list is a result of consideration of the replies received, together with research by the chemical laboratory of the Customs Division at New York.

The official list contains nearly twice as many colors classed as standard for the purposes of assessing duties as did the tentative list. Also the name of the manufacturer is indicated by an initial key, while similar dyes which are to be assessed by grouping with one of those specifically named as a standard also show considerable amplification.

Selection of a dye as of standard strength does not guarantee its quality by the government, but merely indicates a fixed strength for the purpose of assessing duties under the tariff act.

By the terms of paragraph 28 of the tariff act, coal-tar products are to be assessed for import duty on the basis of strength of ordinary commercial imports prior to July 1, 1914. Many colors are now being imported in higher concentrations than at that time and the specific duty of 7c. per pound in such cases will be multiplied by the ratio of strength the importation bears to the strength of commercial imports previous to the date mentioned. The ad valorem duty naturally is not affected by this provision of the paragraph.

National Fire Prevention Is Keynote for Exposition

A growing interest in fire prevention is evidenced in the plans set forth for an exposition and a congress to be held this year during fire prevention week. The Seventy-first Regiment Armory, New York City, during the week of Oct. 8, is to be used for the exposition. H. L. Miner, manager of the fire protection division of E. I. du Pont de Nemours & Co., is chairman.

The figures for devastation by fire during 1922 will be emphasized. Forty human lives a day and a thousand dollars a minute in property are said to represent these losses. Even more important will be the plain demonstration that most of this destruction is entirely preventable. The exposition will not be theoretical but constructive. It will present hundreds of devices and processes that have been tested, with reference to eliminating their natural fire hazard, or to demonstrating their ability to protect from fire, by the searching investigations of that entirely non-commercial institution, Underwriters' Laboratories.

News Notes

A new blast-furnace plant, involving the expenditure of between $3,000,000 and $4,000,000, is planned to be erected in Everett, Mass., by interests identified with the Massachusetts Gas Co. This company already has a large coke works and oil refinery located in that city.

The 8-hour day in the steel industry has become a reality in the United States Steel Corporation's mills. The change began on Aug. 13 and it is reported that by the end of the year every Gary worker will be on the shorter day. Estimates indicate that when the change has been made throughout the country, 65,000 new workers will be employed with an increased annual payroll of $45,000,000.

Long Island may become a sugar beet raising area if present plans of the L.I.R.R. mature. Prizes are being offered by the railroad as an inducement to raise beets. Experiments conducted over the past 10 years show crops excel in three essentials, tonnage per acre, percentage of sugar content and purity of juice. Long Island soil and climatic conditions said to be peculiarly adapted to beet sugar cultivation, and yields exceed best results in United States and Europe.

Glass plants at Millville, N. J., have closed down for the regular summer curtailment period, and will not reopen for a number of weeks. During this time repairs and improvements will be made to machinery, including the rebuilding of furnaces to make ready for the fall blast. The past season has been one of the most prosperous ones in recent years. The plants have been giving employment, collectively, to about 3,500 operatives.

The Laurentide Pulp & Paper Co., with a view to guarding its future supply of raw material, is engaged in a tree-planting program which promises to assume enormous dimensions. At present the company is engaged in setting out one million new trees per year, which are grown in its own nurseries. By 1925, however, it is proposed to extend the planting to five million trees per year.

The Second National Exposition of Power and Mechanical Engineering is to be held on the lower floor of Grand Central Palace, New York, from Dec. 3 to 8, 1923. Present demand for space and interest displayed by engineers are regarded by the management to indicate a bigger and better show this year than last.

Near Ellerhouse station, on the Dominion Atlantic Railway in the province of Nova Scotia, Canada, a discovery of ocher has been made. The visible supply is large, the color is uniform throughout, very little gritty material exists in the main body, and development possibilities are excellent.

Investigation Ordered Into Production Costs of Aminol Salts and Magnesite

Tariff Commission Acts on Applications for Changes in Duties—General Survey of Thymol to Be Made

THE Tariff Commission has ordered an investigation under the flexible provisions of the tariff act into costs of production of rare sugars and of aminol salts and aminol acids, appearing in paragraphs 504, 1, and 5 of the 1922 tariff. Investigation is the result of an application by the Special Chemicals Co., of Highland Park, Ill., which asserts that competition from Germany is putting these products into this country at a sales price considerably less than the cost of production in the United States. The application asks that American valuation be imposed on these products in order more adequately to protect the domestic industry.

Both the rare sugars and the aminol product are chemicals of small production but of considerable importance in laboratory work. Their uses in the medicinal field are increasing steadily and it is said that the War Department is keenly interested in having an assured supply of domestic production for hospital use in the event of a future conflict.

Investigation of Thymol

A survey under the general powers of the Tariff Commission which possibly will develop into an investigation under the flexible provisions of the new act has been ordered into thymol, including thymol crystals. The Verona Chemical Co., of North Newark, N. J., and the Orbis Products Trading Co., of New York City, have filed applications with the commission for increases in the present duty of 35 per cent ad valorem on thymol. The commission is not satisfied with the data it has on this product and will make the general survey before deciding whether to proceed under the terms of the tariff.

Thymol is a medicinal which is made in the United States principally from ajowan seed imported from India. The Tariff Commission has been informed that the imported thymol is sold at New York at $2 a pound and that this is less than the cost of production in the United States of merely assembling the raw materials without adding any profit. The commission is requested in the applications to place thymol in paragraph 28 for the purposes of assessment of duty, which would mean the application of American valuation, inasmuch as it is contended that the imported product is from a coal-tar base. As paragraph 26, in which thymol is named in the 1922 tariff act, is not included among the paragraphs specified in paragraph 28 whose products may be assessed under the latter paragraph, it would not be possible for the commission to grant this request. It is asserted that the average price of the domestic product has been around $3.25 a pound, and that the volume of sales ranges from 70,000 to 75,000 lb. annually.

The Tariff Commission also has ordered an investigation under the flexible tariff into costs of production of magnesite, upon application of four Austrian corporations. The commission has ordered a general survey into costs of production of sugar beets.

Nitro-Benzene Effective Against Tobacco Pests

Nitro-benzene has proved to be highly effective as a poisoned bait flavoring for use in connection with the control of tobacco wire worms. Apparently by this discovery the chemists at the tobacco laboratory of the Department of Agriculture at Clarksville, Tenn., have solved the control of a very serious tobacco pest. In five series of large-scale experiments in tobacco fields, they were able to reduce wire worm infestation from 50 to 60 per cent, by the use of this chemical as a bait flavoring.

Canadian Peat Company Goes Into Private Hands

An order-in-council has been passed by the Ontario Government authorizing the disposal of the premises of the Alfred peat manufacturing experimental plant and the newly developed cutting and drying machinery to some private individual, who will operate it on a commercial basis. A short time ago the Dominion Government, which was half owner with the provincial authorities, decided to spend no more money on the plant, which has been operating for 4 years. Both governments have come to the conclusion that owing to its bulk, and for other reasons, peat cannot be transported economically any great distance.

Technical Paper Men to Gather at Exposition

The Technical Association of the Pulp and Paper Industry will hold a fall meeting this year in connection with the 1923 Chemical Exposition during the week Sept. 17 to 22 at the Grand Central Palace, New York. This has been the custom of the association during the past few years. Speakers at the meeting will be chiefly representatives from firms exhibiting at the exposition, and the talks will be 15-minute discussions on various types of apparatus, equipment and chemical products for the paper and pulp mills. The exact day of the meeting has not yet been decided upon.

Round Table Discussions to Feature Fall Meeting of Electrochemists

Trips to Many Plating, Brass and Other Plants Planned—Two Symposiums Included

DAYTON, OHIO, has been chosen as the place of getting together for the fall meeting of the American Electrochemical Society with headquarters at the Miami Hotel. The technical meetings from Sept. 27 to 29 will be devoted in part to two symposiums, of which one will be on "Electrochemistry of Gaseous Conduction." Duncan MacRae of the research department of the Westinghouse Electric & Manufacturing Co. will act as chairman. This session will include a number of most interesting papers and discussions on triatomic hydrogen, ozone, X-ray tubes, audions, neon lamps, Beck arc, oxidation of atmospheric nitrogen, etc. A number of very interesting papers are in the course of preparation by men who are well qualified to discuss these respective subjects.

The other subject of the symposium covers "Recent Developments in Electrolytic Refining of Metals." F. R. Pyne of the U. S. Metals Refining Co., Carteret, N. J., will act as chairman. This program will embody papers on copper, tin, lead, nickel, zinc, iron, etc.

Round Table Discussions

An innovation of this meeting will be a round table discussion on the following four subjects: Electric furnace brass foundry practice, utilization of chlorine, organic electrochemistry, and electroplating. These round table discussions will be presided over by men recognized as authorities on these particular subjects.

The discussion on brass furnaces will be of particular interest to foundrymen in general. Many brass foundries are located in Dayton and the many phases of the brass-melting art will be discussed. The subject of electric melting will occupy its share of the discussion, and it is expected that some reliable figures on the relative costs of melting by electricity and fuel fired furnaces will be established.

As Dayton is one of the largest and most important electroplating centers on account of the large amount of electroplating carried on by companies such as the National Cash Register Co. and others, it is of interest to know that a round table discussion on electroplating will be held during the Dayton meeting. S. Skowronski, chief chemist of the Raritan Copper Works, is chairman of this division and will preside. Walter Fraine, superintendent of the electroplating department of the National Cash Register Co., will take an active part in the discussion.

The round table discussion on the utilization of chlorine will be of especial interest to a large number of the membership as well as to outsiders. Albert H. Hooker, Ralph H. McKee, Edward D. Kingsley and others will participate. Topics such as the utilization of chlorine in the manufacture of poison gases for peace times, the manufacture of hydrochloric acid from chlorine, etc., will be brought up.

Another topic for round table discussion will cover organic electrochemistry and this will be in charge of Dr. C. J. Thatcher, who is well known as the inventor of the filtros cell and various other processes for making photographic developers by electrolytic processes. Prof. Alexander Lowy of the University of Pittsburgh and A. W. Burwell of Poughkeepsie are among those who will take an active part in the discussion.

Dayton Offers Many Attractions

The society feels that it is fortunate in being able to meet at Dayton. The Dayton Chamber of Commerce is now taking an active part and arrangements are being made to handle the convention in the fall. The Chamber is also publishing an illustrated booklet devoted to the meeting and of various places of interest in and around Dayton.

To those interested in excursion trips to industrial plants and places of interest, Dayton offers a large number of attractions. Among the larger plants are National Cash Register Co., Delco, Delco-Light, Duriron, General Motors Research Laboratories, McCook Field, Wilbur Wright Field, Miami Conservatory. The American Rolling Mills are located only a short distance away and will also be open for inspection.

The social side of the meeting will not be entirely neglected. Dayton offers three golf courses, and these, it is expected, will be largely patronized. It is expected that the attendance of the membership will be one of the largest in the history of the society. A cordial welcome is extended to all non-members interested in electrochemistry to attend all technical meetings and discussions. Complete information can be secured later by conferring with Dr. Colin G. Fink, secretary of the American Electrochemical Society, Columbia University, New York, N. Y.

Cotton Mills to Merge

Reports from Providence, R. I., state that a merger will be effected this week whereby the property and assets of the Manville Co. will be taken over by the Jenckes Spinning Co. The transfer will unite two of the largest cotton-manufacturing concerns in Rhode Island, and the new corporation, to be known as the Manville-Jenckes Co., will be one of the largest units in the cotton industry in America, with a capitalization of \$39,000,000, operating nine plants employing more than 5,500 persons.

Georgia Places Record Contract for Calcium Arsenate

Announcement was made last week that the State Board of Entomology of Georgia had placed a 5-year contract for calcium arsenate which called for annual deliveries of 20,000,000 lb. at a price of 10c. per lb.

J. J. Brown, Commissioner of Agriculture, in making this public stated that the State Board of Entomology had just closed a 5-year contract with the National Gold Arsenic Corporation for an annual supply of 20,000,000 lb. of calcium arsenate at 10c. per lb., with an option on additional quantities in the event of a demand for same in any one or all of the 5 years of the contract.

A plant for the manufacture of this arsenic will shortly be erected in Georgia and lime deposits of the state will be utilized to supply the necessary lime.

He also recalled that an announcement had been made several weeks ago through the department and through Edgar Watkins, president of the City Club, that Governor Clifford Walker had appointed a committee consisting of Henry B. Kennedy, vice-president of the Fulton National Bank, and Ira W. Williams, State Entomologist, to inspect the properties of the National Gold Arsenic Corporation, located in Washington State, in order that they might be assured of the ability of the corporation to supply the required amount of arsenic.

After a thorough inspection of the properties by the above mentioned gentlemen, who brought back samples which have since been approved by the state departments of geology and chemistry, and further investigation through the banks and other sources, the report showed that the company was capable of supplying sufficient quantity to meet the demand of the cotton growing area of the South for many years to come.

Fast Service to Milwaukee for A.C.S. Members

To accommodate those who wish to leave New York and way points at the latest possible moment and still to be in Milwaukee in time for the fall meeting of the American Chemical Society which opens on Monday, Sept. 10, special train equipment has been secured. Accommodations on the special cars which have been added to the Twentieth Century from New York on Sept. 9 may be secured by writing directly to N. Moony, assistant general passenger agent, New York Central R.R., Grand Central Terminal, New York City.

Although the final program for the meeting is not available at the time of going to press, it is certain that the various sectional meetings are to be rounded out by a large number of papers. The gas and fuel section is especially active in preparing its program, with J. D. Davis, Bureau of Mines, Pittsburgh, Pa., in charge.

World Review of the Paint Situation

Domestic Production and Consumption Increased in 1922, but Foreign Trade Declined—Exports of Ready Mixed Paints Cut in Half

THE Chemical Division, Bureau of Foreign and Domestic Commerce, has issued a special circular in which conditions surrounding the paint industry in various parts of the world are set forth. The circular states that the revival of the paint and varnish industry in 1922, after the general slump in business in 1921, was quite marked and the industry presents every appearance of progressing on a sound healthy basis at the present time. In the United States improvement in all lines of business and especially the large amount of construction carried on accounts to a great extent for this encouraging showing, but undoubtedly the continuous efforts of the "Save the Surface" campaign was a big factor.

The detailed figures of the increases in production in the different classes of paints and paint materials were disseminated to the trade several months ago. These show that the quantity of paint and varnish produced in 1922 in the United States was nearly 12 per cent greater than in 1920, the previous peak year, and it is probable that the industry will show a proportionate increase in 1923.

It follows directly that an increased export trade will help to set a new high level for sales of American paints, varnishes and kindred materials. The value of our domestic production in 1920 was around 400 million dollars and our exports amounted to 28 million dollars. In 1921 this export figure declined to about 12 million dollars and in 1922 to 11½ million dollars. This decline in value of our exports of paints and varnishes is attributed to a certain extent to the deflated values in 1922 as compared with 1920, and is not as indicative of a loss in volume in foreign trade as the proportionate decrease in value. Exception to this statement may be made in the case of ready mixed paints, which showed in 1922 a 50 per cent reduction both in quantity and in value as compared with 1920. This is a serious enough situation to warrant its careful consideration by the industry.

Latin America

Mexico, our neighbor on the south, has experienced conditions which did not tend toward stabilizing trade; also the type of dwelling common in this country does not require the same amount of paint as the average American home, and they are not painted nearly as frequently.

Cuba, during the past two years and a half, has passed through a serious business and financial crisis; yet it has continued to be a good market for American paint and varnish products. On account of our proximity, capital investments, and a 20 per cent preferential on import duties, we supply more than 90 per cent of Cuba's requirements. As conditions there are improving noticeably, this year's business in exports of paints to Cuba should show a material increase over those of 1922. House paints seem to be the most in demand and next in importance is paint for metal work. Cheapness has been an important factor in marketing paints in Cuba, but the use of high-grade paint products is slowly increasing and can be stimulated by advertising and demonstration.

Argentina is our best customer in Latin America. There are represented, in this country, something like 40 paint manufacturers and competition is very keen. Included in these are some of the most prominent American producers. Probably two-thirds of the paint factories represented in Argentina are British. The British have the advantage in this trade since they have their own stores for distribution and many of the public utilities and large industries are in their hands. The possibilities for prepared paints are small, relatively speaking, as it is the custom in most cases for contractors to mix their own paints.

On the west coast Chile is the most important field and the municipal law in effect in practically every Chilean city which compels house owners to paint their edifices once annually (before September 15) keeps up the demand for paints.

Europe

In spite of the fact that Europe holds an important position in the production of paints, confined to England, Germany, Belgium, Holland, France, and to some extent Italy, American exporters still find it a good customer. This applies, naturally, more to the raw materials than to the finished products.

England and Germany, being large producers, purchase small amounts of our ready to use products. In fact in 1922 Germany took very little of any class of paints or raw materials from the United States, with the exception of carbon and lamp blacks.

The Norwegian market for paints is supplied by its own manufacturers as well as by imports from Germany, England and Holland. The use of prepared paints is understood, but they are utilized to a very small extent on account of the cost. The greater part of the paints in Norway are used on ships and the exteriors of buildings.

Sweden produces paints and even exports some, but in this connection it must be noted that Sweden is a distributing point for products going to the countries bordering on the Baltic Sea.

In both Norway and Sweden the painting is done to a very large extent by tradesmen and interior decorators so that considerable amounts of the paint materials are imported as such and mixed in the country. Germany is the largest supplier, with England, Spain and Italy entering to a lesser degree.

A rather peculiar condition exists in France. This country manufactures a sufficient amount of paint products to satisfy domestic consumption, yet foreign paints enter this field because of the fact that French manufacturers, apparently, have been selling a rather poor quality and for this reason the French purchaser is apt to be wary of French paints. France imports practically all of the raw paint materials used.

Belgium and Holland, being large producers in comparison with their size, and because of their close proximity to Germany, offer very little opportunity for the sale of American paint and paint products.

The greater part of the paints manufactured in Italy are produced in the northern section and a part of this production is exported. However, Italy is unable to supply domestic requirements and must therefore import. Owing to the stone type of house in vogue throughout this country inside paints are principally used, very little outside paint being considered necessary.

In Sicily, Palermo presents the best opportunity, but otherwise the consumption is very small. English and Italian paints are imported.

Near East

In the Near East Egypt presents a favorable opportunity for ready mixed paints and varnishes with the exception of industrial varnishes, Egypt not being an industrial country. The presence of representatives of other countries already well established causes a highly competitive situation, but it is believed that American exporters can be successful in this field.

Syria has no production of its own. The market is very limited, industrial varnishes are not used at all, and the type of dwelling common to this country does not require painting. England and France are the present suppliers.

Conditions are such in the other countries of the Near East—Turkey, Persia and the Arabian group—that very little interpretation can be made of the present-day market. The usual competing countries such as England and Germany are to be found established in this field.

Exports of paints and paint materials from the United States in 1922 were:

		Value
Zinc oxide, lb	7,953,847	$593,128
Lithopone, lb	3,231,722	169,082
Carbon and lamp black, lb.	17,062,311	2,028,105
Bone black, lb	2,056,593	117,014
Red lead and litharge, lb	3,366,375	294,133
Sublimed lead, lb	524,975	36,584
White lead, lb	9,196,656	710,765
Mineral earth, pigments, whiting, lb	27,678,305	972,735
Other chemical pigments	2,314,040	377,713
Enamel paints, lb	1,501,520	418,521
Flat interior paints, gal	14,503	34,807
Other ready mixed paints, gal	1,337,393	2,734,325
Other paints	10,188,393	1,720,360
Spirit varnishes, gal	46,348	80,127
Oil varnishes, gal	376,416	57,117
Other varnishes, gal	352,331	533,844
Total		$11,479,260

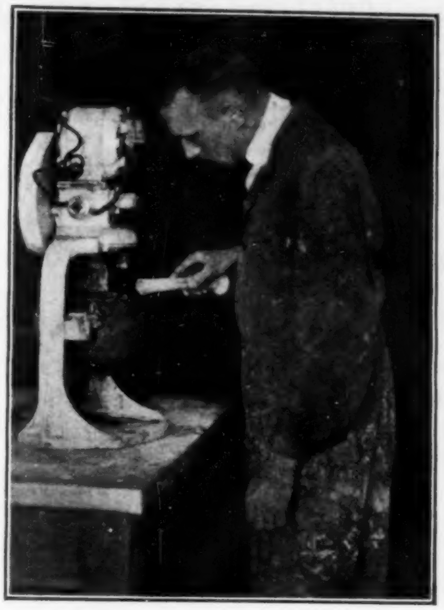
New Glue Invented by A. C. Lindauer

Long Search for Waterproof Glue Results in Satisfactory Blood Albumin Product

A highly water-resistant blood albumin glue which can be applied without the use of a hot press has been invented by A. C. Lindauer of the Forest Products Laboratory, U. S. Forest Service. The development of this glue is the latest and most promising advance made as a result of the long-continued search by the government laboratory for a satisfactory waterproof glue for wood.

The blood glues now used show considerable resistance to moisture, but all require pressing in a press with steam-heated plates, a relatively slow process calling for very expensive equipment. The new glue, which is made by the addition of paraformaldehyde and ammonia to blood albumin, can be used with presses of the same sort used in gluing with animal, vegetable, or casein glues.

The cold press blood glue has greater water resistance than any casein or blood glue hitherto tested by the laboratory and has sufficient strength for use in plywood. Plywood test specimens which were placed in the fungus pit of the Forest Products Laboratory under conditions of excessive humidity for a period of 1 year required a shearing force of 300 lb. to break them apart, and specimens submerged in water for a period of 1 month proved to be equally strong. The U. S. navy specifications for water-resistant plywood specimens of the same type call for a strength of 180 lb. after soaking for 2 days. The fungus pit condition endured for even a few months is known to be more severe than a 2-day submergence test.



A. C. LINDAUER

The ease with which the new blood glue can be spread and molded and its high water resistance may lead to uses parallel to those of the numerous synthetic gums and rubbers of similar composition.

In accordance with the usual custom in cases where patents are granted on the results of government research, the new glue formula is dedicated by the Forest Products Laboratory to the free use of the public.

Royal Commission Named to Investigate Pulpwood

No Action to Be Taken by Canadian Government Until Findings of Commission Are Announced

The Royal Commission to investigate Canada's pulpwood resources and the advisability of prohibiting the export of these products has been appointed. The commission is headed by Joseph Picard, a Quebec manufacturer and business man.

Instructions have been issued to the commission to inquire into the report upon the forest resources, with particular regard to the extent to which the various kinds of wood suitable for pulp production are available. Further directions to the commission follow:

1. To inquire into the quantity of pulp available, owned by the provincial governments and subject under provincial laws and regulations to restriction requiring the partial or total manufacture of such wood in Canada.

2. To inquire into the quantity of wood available on lands owned by the dominion government and subject under federal laws and regulations to restrictions requiring partial or total manufacture in Canada.

3. To ascertain the quantity of wood on other lands and the conditions under which such lands are held, whether by ownership or lease, whether by corporation or by individuals, whether by citizens of Canada or by citizens of other countries.

4. To check the quantity of pulpwood produced in each province during the past 10 years, showing the proportion used in Canada and the proportion exported.

5. To look into the question of the restriction of the export of pulpwood from Canada and any other matter touching upon the production, manufacture or sale of pulpwood. Such other information as may be deemed essential to a comprehensive consideration of the question of the restrictions of export will likewise be sought.

The major work of the commission is to make suggestions and recommendations that may be deemed expedient for the better conservation of the supply of pulpwood for present and future use. This investigation is the outcome of the last session of Parliament when the government was given power to prohibit the export of pulpwood. At that time the Minister of Finance promised that the government would not exercise its authority in this respect until after a searching review of the whole situation had been made.

Trade Notes

The William O. Goodrich Co., crusher of linseed at Milwaukee, has appointed Baker & Collinson sales agents for the state of Michigan.

The Apex Chemical Co. will build an addition to its plant at Elizabethport, N. J.

L. M. Bogle will have charge of the branch office of H. J. Baker & Bro., recently opened at Atlanta, Ga.

Construction work on the silk fiber plant of the du Pont Fibre Silk Co. is expected to begin this month. The plant will be built near Nashville.

The importation into Mexico of all narcotic drugs has been prohibited, except by the Public Health Department of the government, according to a Mexican decree effective July 28, 1923, says a cablegram to the Department of Commerce from Assistant Trade Commissioner H. B. MacKenzie, Mexico City. Formerly responsible pharmacies legally established were allowed to import these drugs after securing a permit from the Department of Health.

During 1922 Siam exported to the United States goods to the value of $174,784, of which shipments of sticklac accounted for more than $100,000.

A report from Greenville, S. C., states that the Beaver Duck plant of the Couch Cotton Mills Co. was sold at auction for $160,000.

The Schaffer Alles Chemical Co. of Pittsburgh, Pa., has changed its name to the Alles Harrison Chemical Co.

The United States Rubber Co. is establishing a factory in the port of Swettenham in the Federated Malay States for the treatment of latex by the Hopkinson process, using 300 tons monthly. It is understood the company also plans to ship latex in liquid form to the United States.

Edward Plaut, president of Lehn & Fink, Inc., sailed for Europe last week and will spend about 6 weeks in England, France and Germany.

Judson P. McElwain, of Kelloggs & Miller, linseed crushers, died suddenly on August 13, at his home in Amsterdam, N. Y. He was a member of the New York Produce Exchange and well known in linseed circles.

Harold Hadden, formerly connected with the sales department of the New Jersey Zinc Co. at Pittsburgh, has been transferred to the New York office of the company.

The use of calcium carbide is gradually decreasing in the State of Sao Paulo, Brazil. Formerly foreign manufacturers supplied this field to a considerable extent, but imported grades have been driven from the market because of inability to compete in price with the native product, especially that manufactured at Palmyra, Minas Geraes.

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices Imports and Exports The Trend of Business

Prices for Chemicals Steadier Under Improved Buying Movement

Moderate Increase in Demand for Prompt Deliveries With Some Contracting for Distant Positions

THE weighted index for the week shows a material gain. In great part this was due to a stronger market for cottonseed oil and to advances in some allied products. Basic chemicals were steady but a firmer feeling is noted in the general list and with few exceptions selling pressure has been disappearing.

Actual business placed during the week was reported to show a gain over recent weeks. In addition to a freer movement of spot and nearby goods there was more of an inclination on the part of buyers to cover requirements over the balance of the year and even through the first quarter of next year. Some of the heavy chemicals are said to have been favored in this contract business.

Reports of heavy damage to the cotton crop have stimulated demand for calcium arsenate and heavy buying was noted with most attention given to stocks held at southern points. The trade also was interested in a report that the state of Georgia had placed a contract covering deliveries over a period of 5 years. Arsenic responded to the increased call for arsenate and spot prices were higher and there was as well a somewhat firmer tone to the shipment market.

Mineral acids have been quiet but a little better call is beginning to be heard and as stocks have not accumulated unduly, the quoted prices generally are being maintained. Some of the other acids, notably tartaric and citric, were quiet and none too steady in price. Oxalic acid is quiet with rather keen competition between domestic and foreign makes.

Imported chemicals have been strengthened in the spot market by reports of higher prices for shipments from abroad. Last week different holders advanced their prices on spot permanganate of potash because they could not replace these goods at current levels. Imported prussiates, both potash and soda, were practically unchanged.

Good inquiry is noted for phosphorus, but the market is about bare of supplies and the output is said to be sold ahead with much uncertainty about future supplies. This condition has existed for some time and many consumers are working on small stocks and soon will be in need of fresh supplies with very poor prospects of obtaining them.

Spot Arsenic Higher—South Buys Calcium Arsenate—Bichromates Quiet—Permanganate of Potash Strong—Export Inquiry for Caustic Soda—Price Cutting in Bleach—Caustic Potash Steady—Yellow Prussiate of Potash Easy—Imported Tartaric Acid Lower.

Acids

Acetic Acid—No change is reported in the position of raw materials and this is reflected in an unchanged market for acid. All grades are moving in a more or less routine way with new business moderate. Prices are quoted at \$3.38@\$3.63 per 100 lb. for 28 per cent; \$6.78@\$7.13 per 100 lb. for 56 per cent; \$9.58@\$9.83 per 100 lb. for 80 per cent; \$12@\$12.78 per 100 lb. for glacial.

Citric Acid—Continued lack of buying interest has given an easy tone to this market. Holders have not forced matters but were ready to meet buyers with attractive prices. The open quotation is 50@51c. per lb. for imported but according to rumors 49c. per lb. could be done on firm bids. Domestic was steady at 49@50c. per lb.

Formic Acid—A fairly steady call has been found for imported acid. Moderate sized lots are most in demand but total volume of business is up to standard. Prices show some range according to seller and quantity. Quotations are 12@14c. per lb.

Muriatic Acid—New business is slow in developing and in general the market is described as quiet. There is a moderate withdrawal against old orders. Prices have been held on a pretty steady basis throughout the summer and this condition still holds true. Asking prices are 90c.@\$1 per 100 lb. for 18 deg.; \$1@\$1.10 per 100 lb. for 20 deg.; and \$1.75@\$2 per 100 lb. for 22 deg.

Nitric Acid—Offerings continue to be free and as buyers are not operating actively the quoted prices are easy. Holders have been competing keenly and it still is a buyers' market. Quotations are \$4.50@\$5 per 100 lb. for 36 deg.; \$5@\$5.50 per 100 lb. for 40 deg.; and \$5.25@\$5.75 per 100 lb. for 42 deg.

Oxalic Acid—Holders of imported are asking 12½c. per lb. for spot goods and the market appeared to be firm at that level. Demand is confined to moderate sized lots. Domestic acid continues to hold at 12¼c. per lb. at works and upward on a quantity basis.

Tartaric Acid—The recent decline in price on the part of some sellers of domestic acid has given an easier tone to the market for imported. In most quarters 34c. per lb. is asked for imported but there were sellers at 33c. per lb. It was also stated that 33c. per lb. could be done on shipment, the asking price for domestic was pretty well maintained at 36c. per lb.

Potashes

Bichromate of Potash—This market has been relatively weaker than that for bichromate of soda. Quotations of 10¾c. per lb. are heard but there were sellers at 10½c. per lb. and even that figure might have been shaded according to some reports. Export inquiry is very dull and domestic consumers are slow to take hold.

Caustic Potash—Prices have held steady without any material improvement in demand. Stocks are said to be light and shipment prices are holding up with a corresponding effect on the spot market. Domestic caustic is held at 9c. per lb. and upward at works and considerable amounts have moved at that price in spite of the lower levels at which imported was offered.

Permanganate of Potash—It is reported that 17c. per lb. can be done on domestic material f.o.b. western producing point. Imported material has been gradually strengthening in price. There has been no business recently for shipment as asking prices were around 20c. per lb. which was too high to interest either importers or consumers. Spot stocks have been reduced and with very little coming in the tendency of prices has been to harden. Some goods sold at 17c. per lb., spot, last week but toward the close most sellers were up to 17½c. per lb. and in some quarters 18c. per lb. was asked.

Prussiate of Potash—The spot market has been irregular and it is difficult to hold prices on a stable basis. As soon as stocks increase selling pressure appears and prices are cut in order to attract buyers. During the week there were offerings on spot at 33c. per lb. with many sellers

out for 34c. per lb. For shipment from abroad 30c. per lb. was quoted.

Sodas

Bichromate of Soda—The price generally quoted was 7⅞c. per lb. and while reports are heard that 7¾c. per lb. could be done, the market did not appear to be weak. Some sellers look for an increase in buying orders as consuming trades are becoming more active. Conflicting reports are heard about the amount of stocks in sellers' hands but any selling pressure which has developed appears to have come from lack of consuming interest rather than that stocks were oppressive.

Caustic Soda—A much better tone has been evident in the market with numerous inquiries for export. There were different bids on a basis of 3.10c. per lb., f.a.s., which were said to have gone unfilled as holders were asking 3.15@3.20c. per lb. For the so-called standard brands the general asking price is 3.30c. per lb., f.a.s. Inquiry from domestic buyers also is reported as more active. The quotation for 76 per cent in carlots, at works, is steady at 3.16½c. per lb. Flake and ground are unchanged at 3.60c. per lb.

Carbonate of Soda—There has been a steady movement on old orders and this has taken up the greater part of production. There is not much call for spot goods but this is accounted for by the fact that consumers are covered ahead. Some inquiry has been reported for new contracts and prices are given at 2c. per lb.

Fluoride of Soda—Some concessions can still be obtained from holders of domestic fluoride. The inside quotation is 10c. per lb. but with demand moderate and imported on the market the quoted prices could be shaded. Imported is held at 8¾@9c. per lb.

Nitrate of Soda—Outside of the order placed recently by independent fertilizer companies, there has been very little activity. Some reports say that buying is slow because of slow collections in the south and that a freer trading movement may be looked for when a greater part of the cotton crop has been marketed. In the meantime the market is in a waiting position. Prices are holding at $2.45 per 100 lb. for spot and prompt.

Nitrite of Soda—A firm tone has characterized the market. Imported material is steady abroad and spot goods reflect this condition. Prices for imported vary according to grade and seller. Norwegian is quoted at 7¾c. per lb. with other grades at 7½c. per lb. Domestic makers are offering on a basis of 7¼c. per lb. at works.

Prussiate of Soda—The spot market for imported was generally held at 14¼c. per lb. but a few lots might be picked up at 14c. per lb. For shipment 14c. per lb. could be done. Domestic prussiate holds at 14½c. per lb. with this price holding good over the month.

"Chem. & Met." Weighted Index of Chemical Prices

Base = for 1913-14

This week	**168.90**
Last week	166.72
Aug., 1918	278.00
Aug., 1919	251.00
Aug., 1920	264.00
Aug., 1921	158.00
Aug., 1922	152.00

Crude cottonseed oil for immediate shipment from mills advanced sharply, and, this is reflected in the 218 points gain in the week's index number.

Miscellaneous Chemicals

Arsenic—Imported demand for calcium arsenate brought out a firmer feeling in the market for white arsenic. Spot goods were advanced in price and for the greater part of the period 10c. per lb. was quoted as the inside figure at which stocks could be secured. Some producers also put up their contract figures to 9½c. per lb. but it was stated that lots of 500 tons for delivery over the balance of the year were available at 9c. per lb.

Bleaching Powder — The situation showed no change during the week and prices are reported to be irregular. The open quotation of producers is $1.75 per 100 lb. at works but the trading basis for some weeks has been below that level and buyers have found no difficulty in doing around $1.50 per 100 lb.

Calcium Arsenate—Of importance in the market was an announcement from Atlanta that the state of Georgia had placed a contract for 20,000,000 lb. annually for a period of 5 years. The price is reported to be 10c. per lb. The south also was interested in spot and immediate shipment. Sales of from 200 to 500 tons are said to have been made, some crediting the outside figure. Preference was given to stocks held at southern points. Bid prices were 12c. per lb. but New York material offered at that figure was not in demand as buyers for the most part wanted immediate delivery and were looking for a 12c. delivered price.

Formaldehyde—Only limited call for stocks has been felt and the tone is easy. First hands are quoting 14½c. per lb. but with some resale goods on the market and buying orders slow, it is possible to do 14c. per lb. in different directions.

Manganese Sulphate—A new producer has entered the field and is offering quality testing above 92 per cent manganese sulphate at 8c. per lb. f.o.b. works, packed in metal containers.

Copperas—Demand has not been active recently but producers are carrying very little stocks and are moving their output regularly against contracts. This keeps prices in a firm position with quotations at $20 per ton for bulk goods and $25 per ton for bbl. Imported grades are offered in the spot market at 1½c. per lb. with this figure subject to some modifications according to seller.

Salt Cake—Producers of salt cake are well sold ahead and no round lots are to be found in the spot market. Prices are more or less nominal in the absence of offerings. Natural also is nominal with prices quoted f.o.b. western producing points.

Alcohol

There was a fair call for denatured alcohol and leading producers reported a firmer undertone. Additional material arrived from Porto Rico last week. The steadier feeling did not result in any price changes. Formula No. 1, 190 proof, specially denatured was offered on the basis of 38c. per gal., in drums, carload lots. Formula No. 1, completely denatured, 188 proof, was maintained at 39c. per gal., in drums. There was little or no change in the position of ethyl spirits, the U.S.P. grade, 190 proof, holding at $4.75 per gal., in bbl. Methanol was quotably unchanged at $1.18 per gal. on the 95 per cent, and $1.20 per gal. on the 97 per cent, in bbl., round-lot basis.

Texas Cement Industry Healthy

The Texas Chamber of Commerce, Austin, Burt C. Blanton, manager, industrial department, has completed a survey of the cement industry of the state, showing four active companies with going plants at the present time. These include the Texas Portland Cement Co., with two mills, at Dallas and Houston, respectively; the Trinity Portland Cement Co., with plant at Dallas; the San Antonio Portland Cement Co., with one local mill; and the El Paso Portland Cement Co., with single mill at El Paso. The total output of the five plants approximates 4,600,000 bbl. per year, with gross valuation at present market prices of $8,970,000. Employment is given to 1,025 persons at the plants.

Gasoline Consumption Gains

Gasoline figures presented by the U. S. Bureau of Mines show the immediate effect on the petroleum situation of June demand. May consumption of gasoline was 21,104,268 gal. daily, but June reports a daily consumption of 23,627,319 gal. This includes domestic use and exports.

Stocks have fallen from 1,328,533,217 gal. as of May 31, to 1,263,583,127 gal. as of June 30.

Canadian Flaxseed Shipments

For the ten months ending June 30 the exports of flaxseed from Canada amounted to 2,190,123 bushels, according to a report of the Dominion Bureau of Statistics. This was shipped to the United States, with the exception of 1,319 bushels to the United Kingdom. This flaxseed was all the product of the Prairie Provinces.

Coal-Tar Products

Price Cutting in Gasoline a Factor in Benzene Market—Resorcin Lower—Salicylates Slightly Firmer

INTEREST centered in the price cutting in gasoline and producers of benzol were concerned about the future for their product. Several operators took the stand that the decline in gasoline prices could be only temporary and they were not disposed to become unduly alarmed. Actual production of benzene has met with some curtailment, which tends to offset to some extent the weakness in the motor fuel market. Demand for benzene from intermediate makers was fair and stocks of the pure were not so heavy as a month ago. Prices varied according to the seller. One producer of technical resorcin announced a reduction of 10c. per pound and it was thought likely that other sellers would meet the decline. Inquiry for salicylates was better and the undertone was a shade firmer than a week ago, especially for spot material. Phenol was nominally unchanged, with business restricted to nearby material only. Consumers did not care to contract ahead, because of the unsettled condition of the market. Cresylic acid was offered quite freely and prices were wholly nominal, depending upon the color, delivery, etc. Naphthalene was inactive, but prices underwent no further change. Foreign markets for crude were quiet and barely steady. Advices from London report that exports of naphthalene from the United Kingdom for the 6 months ended June 30 amounted to 100,474 hundredweight, which compares with 11,958 hundredweight for the corresponding period a year ago. Exports of tar oil and creosote from the United Kingdom for the first half of 1923 amounted to 26,204,279 gal., contrasted with 12,357,773 gal. for the corresponding period a year ago.

Aniline Oil and Salt—Producers reported a steady market for aniline oil, maintaining prices on the 16c. carload lot basis. Aniline salt was offered at 22@23c. per lb., as to quantity and seller.

Benzene—Sharp price reductions in gasoline did not improve the outlook for benzene, but producers were disposed to hold on to supplies in the hope that something will turn up to check the decline in the petroleum product. Actual holdings of benzene are not so large as they were a short time ago, and, with production curtailed in more than one direction, operators refused to meet the views of some of the buyers who inquired for forward material around 20c. per gal., tank car basis, f.o.b. works. The 90 per cent grade settled at 23@25c. per gal., tank car basis, f.o.b. shipping point, the price varying according to the seller. On the pure prices ranged from 25@27c. per gal., tank car basis.

Cresylic Acid—Several parcels arrived from abroad during the past week. Offerings by domestic producers were in evidence at all times and prices were irregular. On the 97 per cent grade there were quotations of 78@90c. per gal.

H-Acid—Scattered lots were about that could have been picked up for less than 80c. per lb.

Naphthalene—No improvement was reported in business and prices were unsettled. Flake, prime white, held at 7@7½c. per lb., immediate delivery, while on contract prices were wholly nominal. Chips for nearby delivery could have been obtained around 5c. per lb., carload basis. Crude for shipment from the other side held at 2¼@2½c. per lb., as to quality.

Pyridine—The spot market was almost bare of supplies and prices were wholly nominal. On forward material for shipment for abroad there were sellers at $4 per gal.

Phenol—The market was a featureless affair. U.S.P. phenol on spot held at 30@35c. per lb. Nearby material was offered at 28c. per lb. On futures, prices were irregular and subject to negotiation.

Resorcin—The market closed 10c. lower on the technical grade, one producer reducing the price to $1.40 per lb.

Salicylic Acid—Most producers held out for 35c. per lb. on the U.S.P. material. Scattered business was placed at this figure and the undertone was slightly firmer.

Xylene—There were offerings of pure xylene for shipment at 60c. per gal. On spot prices held at 65@70c. per gal.

Financial Notes

The Atlas Powder Co. has declared a quarterly dividend of $1 on its common stock of record Aug. 31.

The Standard Oil Co. of New Jersey declared regular quarterly dividends of 25c. on the common and $1.75 on the preferred.

For the year ended June 30, 1923, the Procter & Gamble Co. reports gross business of $109,776,389, compared with $105,655,386 in previous year, and net income of $8,552,825 after depreciation, taxes, etc., against $7,340,327 in year ended June 30, 1922.

Officials of the United Drug Co. estimate that the volume of business for the current year will approximate $125,000,000.

The Heidenkamp Plate Glass Corp. reports net income of $388,154 for the first half of the year. The corporation has purchased or retired all but $825,000 of its 6½ per cent bonds, on which the interest requirements are $53,625 a year. The earnings are therefore more than fourteen times interest requirements.

The Certain-teed Products Corp. for 6 months ended June 30, shows income of $663,425 after charges, federal taxes, depreciation, etc. This compares with net income of $256,083 for the corresponding period of 1922.

Income account of the Commercial Solvents Corp. for the first half of this year shows gross profit of $61,939. The Majestic plant of the U. S. Food Products Corp., at Peoria, Ill., was recently purchased and extensive alterations are being made. Manufacturing will begin there before end of this year.

The report of the Air Reduction Co. for the quarter ended June 30 indicates a substantial gain in the business of the company. Net profits were $728,458, equal to $4.22 per share on outstanding stock.

The International Salt Co. reports net earnings of $333,470 after all expenses and charges in the quarter ended June 30. This is equal to $5.48 a share on the 6,077,130 capital stock outstanding. In the same period last year the company reported earnings of $301,342, equal to $4.95 a share.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	*63⅞	63½
Allied Chem. & Dye	62¾	64½
Allied Chem. & Dye pfd	107¾	107
Am. Ag. Chem	12½	11⅞
Am. Ag. Chem. pfd	32	30½
American Cotton Oil	5⅝	5¼
American Cotton Oil pfd	17⅛	16⅛
Am. Drug Snyd	4⅛	4⅝
Am. Linseed Co	*19	18½
Am. Linseed pfd	39	37
Am. Smelting & Refining Co.	57	58
Am. Smelting & Refin'ng pfd.	96	95¼
Archer-Daniels Mid. Co., w.i.	26	25
Archer-Daniels Mid. Co., pfd.	93	90
Atlas Powder	53⅝	53¾
Casein Co. of Am.	*62	*62
Certain-Teed Products	*25	*26
Commercial Solvents "A"	*32	*32
Corn Products	121⅞	122⅛
Corn Products pfd	120	120
Davison Chem.	29⅝	28⅝
Dow Chem. Co	*42	*42
Du Pont de Nemours	117½	121⅞
Du Pont de Nemours db.	83	83⅛
Freeport-Texas Sulphur	10⅞	11¼
Glidden Co.	*8⅞	*8⅞
Grasselli Chem.	*132	*132
Grasselli Chem. pfd	*105	*105
Hercules Powder	*103	*103
Hercules Powder pfd	*104	*103
Heyden Chem.	1⅞	...
Int'l Ag. Chem. Co	2⅛	2⅛
Int'l Ag. Chem. pfd	7⅞	7½
Int'l Nickel	11⅞	12
Int'l Nickel pfd	78	78½
Int'l Salt	*83	*89
Mathieson Alkali	41⅞	41½
Merck & Co	83	82
National Lead	113⅞	113⅞
National Lead pfd	112⅝	112½
New Jersey Zinc	150	150
Parke, Davis & Co	*79	78½
Pennsylvania Salt	*81	*81
Procter & Gamble	128	128
Sherwin-Williams	28⅞	28¾
Sherwin-Williams pfd	102	102
Tenn. Copper & Chem	9⅛	8⅝
Texas Gulf Sulphur	57⅛	56½
Union Carbide	54⅝	56¼
United Drug	79⅛	*80½
U. S. Industrial Alcohol	47	47⅝
U. S. Industrial Alcohol pfd	*100	*100
Va.-Car. Chem. Co	8⅛	7⅞
Va.-Car. Chem. pfd	22⅛	*22

*Nominal. Other quotations based on last sale.

Vegetable Oils and Fats

Crude Cottonseed Advances—Linseed on Spot Easier—Coconut Steady—Extra Tallow Higher

REPORTS from the cotton belt were unfavorable all week and many in the trade were disposed to lower their estimates on the crop. This brought out a wave of buying by speculators who sold cottonseed oil short. Prices for both crude and refined oil advanced sharply. Cash trade in refined cottonseed oil, as well as lard compound, improved and there is a possibility, according to operators, of a tight market before new crop oil arrives in volume. Linseed oil closed lower on unsettlement in seed. Inquiry for coconut oil was moderate, but prices were steady. Palm oils were lower. Extra tallow advanced ⅛c. per lb.

Cottonseed Oil—The option market on the Produce Exchange was active on covering by shorts. Weather news was unfavorable, especially from Texas, and this led traders to reduce estimates on the crop to 11,000,000 bales and even under. Boll weevil activity was destructive and when the next government condition report is made public it is regarded as certain that it will show deterioration of 6@10 per cent. Texas operators who sold crude about a month ago were credited with buying back contracts. Seed for immediate shipment from southern points sold as high as $40 per ton last week, which compares with $30 per ton less than two weeks ago. Crude oil for August shipment from Texas sold at 8½@8¾c. per lb., f.o.b. mills. First-half of September shipment from mills closed around 8¼@8⅜c. per lb. Late September shipment settled at 8.05 bid. Early October closed at 7¾c., with second-half of October at 7½c. per lb. November-December crude closed nominally at 7¼c. per lb., f.o.b. Texas common points, which compares with recent sales at 6½c. per lb. October refined oil, in bbl., New York, brought close to 10c. per lb., with December at 9.20c. per lb. Bleachable was advanced to 9½c., tanks, Texas. Lard compound was advanced ¼c. to 12 @12¼c. per lb.

Linseed Oil—Prices closed from 1@ 2c. per gal. lower. Inquiry was moderate only and with seed unsettled competition for business led to price cutting. A feature in the market was the easier market in the west. There were offerings in Minneapolis of immediate shipment oil at 88c. per gal., in tanks, with reports of actual business at 86c. In New York spot oil, in cooperage, sold at 94c. per gal., carload basis. September shipment settled nominally at 88c., cooperage included, with October at 83 @85c. and November forward at 80@ 82c. January-April was offered down to 78c. per gal. The large consumers were not anxious about the situation, as the opinion is quite general that no shortage in the world's seed supply is likely to occur over the remainder of the year. The domestic crop is doing well and threshing returns from some sections of Minnesota and South Dakota indicate that the yield per acre is even higher than last year. Advices from Argentina are favorable and farmers are preparing to put in a larger acreage. Stocks of seed at Minneapolis on August 11 amounted to 3,228 bu., against 4,767 bu. the week previous. Export demand for linseed cake was dull and prices unsettled. Spot cake sold down to $32.50 per ton, f.a.s. New York. On futures the market held around $35 per ton.

China Wood Oil—Demand showed no improvement, but prices hardly changed. Spot oil was offered at 22½@23½c. per lb. On futures there were sellers at 22½c., in bbl., f.o.b. New York.

Coconut Oil — A better feeling prevailed in the market for coconut oil and first-hands refused to shade 8½c. per lb. on Ceylon type oil, in tank cars, f.o.b. New York. On the Pacific coast the market held at 7½@7⅝c. per lb., sellers' tanks, September-December shipment.

Corn Oil—September shipments crude sold at 7½c. per lb., f.o.b. point of production, sellers' tanks. The market closed firm.

Olive Oil Foots—Spot offerings increased and there were sellers at 8½c. per lb. In some quarters 8¾c. was an inside price. Inquiry was fair.

Palm Oils—Prices were unsettled on increased offerings from abroad. Lagos for shipment settled at 6⅝c., with Niger at 6⅜c. per lb., c.i.f. New York. Demand showed improvement.

Sesame Oil — Refined oil was advanced to 11½@11¾c. per lb., in bbl., immediate delivery. On futures there were sellers at 10⅝c.

Rapeseed Oil—Spot refined oil sold at 77@78c. per gal., in bbl., as to quantity. On futures the market held at 73@73½c.

Soya Bean Oil—Business was dull. Crude, in sellers' tanks, held at 8½@8¾c. per lb., duty paid, f.o.b. Pacific coast ports, the price depending upon the position. In New York the tank car quotation was 8¾@9c. per lb.

Menhaden Oil — Fishing has been poor, but this was more than offset by dull trading. Recent business in crude went through at 39c. per gal., tanks, f.o.b. fish factory. There were offerings at 40c. all last week, with no buyers.

Tallow, etc.—Several hundred drums of extra tallow sold to a local soaper at 6⅞c. per lb., ex plant, an advance of ⅛c. for the week. The undertone was firm, even after the advance. Yellow grease closed at 5⅞@6c. per lb. Oleo stearine sold at 10c. and later 10¼c. was regarded as inside. No. 1 oleo oil was offered at 11¼@11½c. per lb., cooperage basis.

Miscellaneous Materials

Glycerine—Chemically pure glycerine held at 17c. per lb. in the New York market, while in the middle-west some business went through at 16½c. per lb., in drums, carload basis. The undertone was fairly steady, reflecting continued strength in crude. Foreign crude has changed but little of late and traders say that import prices are a little too high to afford competition with the domestic material. Dynamite settled at 15½c. bid and 16c. asked, carload lots. Soap-lye crude, basis 80 per cent, loose, closed at 11¼c. per lb. Saponification, basis 88 per cent, loose, was offered at 11¾c. per lb.

Naval Stores—Spirits of turpentine advanced early in the week to 96c. per gal., in bbl., ex-yard, on higher selling views in the south. But business fell off at the advance and the undertone towards the close was barely steady. Export trade was quiet. Rosins were in moderate demand and steady prices obtained in all directions. The W. W. grade held around $7 per bbl.

Shellac — The market was firmer despite increased receipts. Primary markets were a shade higher while inquiry here showed moderate improvement. T.N. on spot settled at 56@57c. per lb. Orange super fine was raised to 62c. per lb., with ordinary orange at 60c. Bleached, bonedry, closed at 68@70c. per lb.

Lithopone—Producers reported better business and with no change in the barytes situation prices for the domestic product held steady at 7c. per lb., in bags, and 7¼c. per lb., in bbl. Imported material was available at slight concessions.

White Lead—The movement of lead pigments into consuming channels was reported as satisfactory for this season of the year and, with no important change in the metal situation, prices ruled steady. Corroders continued to quote standard dry white lead (basic carbonate) at 9¼c. per lb. The sulphate was available at 8¾c. per lb., carload basis. The official price for pig lead held at 6.50c. per lb.

Zinc Oxide—The paint trade took hold sparingly, but a fair inquiry was reported as coming from rubber manufacturers. Prices ruled steady. American process oxide, lead free, held at 8c. per lb., with leaded material available at 7@7¼c. per lb. French process, red seal, held at 9¾c., green seal at 10¾c. and white seal at 12c. per lb., carload lots.

Paraffine Wax—There was some export inquiry. Refiners offered crude scale, 122@124 degrees melting point, at 2⅞c. per lb., carload basis, f.o.b. shipping point. On the 124@126 degrees melting point there were sellers at 3c. per lb. Exports of paraffine wax for the fiscal year ending with June 30 amounted to 327,519,243 lb., which compares with 259,517,551 lb. for the corresponding period a year ago.

Imports at the Port of New York

Aug. 9 to Aug. 16

ACIDS—Cresylic—61 dr., Glasgow, Order. **Oxalic**—5 csk., Antwerp, Order; 16 bbl., Rotterdam, Innis, Speiden & Co. **Phosphoric**—199 carboys, Hamburg, Order. **Tartaric**—200 csk., Rotterdam, Order.

ALCOHOL—380 bbl. denatured, Aricebo, C. Esteva; 48 csk. butyl, Bordeaux, Commercial Solvents Corp.

AMMONIUM CARBONATE—10 csk. and 1 cs., Liverpool, Brown Bros. & Co.; 15 csk., Liverpool, J. Turner & Co.; 87 csk., Hamburg, Kutroff, Pickhardt & Co.

AMMONIUM NITRATE—427 csk., Hamburg, Kutroff, Pickhardt & Co.

AMMONIUM BROMIDE—100 cs., Hamburg, National American Bank.

ANTIMONY OXIDE—250 bg., Shanghai, Canadian Bank of Commerce; 500 bg., Shanghai, International Banking Corp.

ANTIMONY—200 bbl., Havre, Heemsoth, Basse & Co.; 500 cs. regulus, Shanghai, Irving Bank-Col. Trust Co.; 250 cs. regulus, Shanghai, Wah Chang Trading Co.; 1,600 cs. regulus, Shanghai, Int'l Banking Corp.

ARSENIC — 100 csk., Hamburg, Ore & Chemical Corp.

BARYTES—2,000 bg., Sevilla, Order.

BAUXITE—60 tons, Paramaribo, A. M. Kohler.

BONES CALCINED—3,030 bg, Buenos Aires, H. J. Baker & Bros.

BRONZE POWDER—9 cs., Bremen, R. Lang; 8 cs., Bremen, B. F. Drakenfeld & Co.

CALCIUM CHLORIDE—124 dr., Hamburg, Bank of America.

CAMPHOR—250 cs., Hamburg, A. Ochse & Co.

CHALK—300 bg., Antwerp, Brooklyn Trust Co.; 2,500 bg., Antwerp, Cooper & Cooper; 314 bg., Antwerp, Irving Bank-Col. Trust Co.; 200 bg., Antwerp, Brown Bros. & Co.; 1,000 bg., Antwerp, L. A. Salomon & Bros.; 6,000 bg., Antwerp, Order; 500 tons, Dunkirk, J. Higman & Co.; 20 csk, Liverpool, McKesson & Robbins.

CHEMICALS—115 dr., Hamburg, Roessler & Hasslacher Chemical Co.; 21 bbl., Hamburg, Hummel & Robinson; 202 dr., Hamburg, A. Klipstein & Co.; 20 csk., Bremen, Roessler & Hasslacher Chemical Co; 83 cs., Bremen, Pfaltz & Bauer; 295 bbl., Antwerp, Order; 280 csk, Rotterdam, Hummel & Robinson; 120 bbl., Hamburg, Roessler & Hasslacher Chemical Co.; 55 pkg., Hamburg, Jungmann & Co.; 206 dr., Hamburg, A. Klipstein & Co.; 45 bbl., Hamburg, Unexcelled M'f'g Co.

COPPERAS — 72 bbl., Hamburg, E. M. Sergeant & Co.

COLORS—5 csk. aniline, Hamburg, Irving Bank-Col. Trust Co.; 45 pkg. aniline, Buenos Aires, National Aniline & Chemical Co.; 30 cs. dry, Southampton, Berengaria; 17 csk. aniline, Havre, Ciba Co., Inc.; 49 csk. aniline, Havre, Geigy Co.; 2 csk. aniline, Antwerp, Bernard, Judae & Co.; 5 bbl. aniline, Genoa, Banka Comm. Italo; 10 bbl., Genoa, Irving Bank-Col. Trust Co.; 1 bbl., Genoa, Order; 213 csk., Rotterdam, Kutroff, Pickhardt & Co.; 4 csk. aniline, Rotterdam, Irving Bank-Col. Trust Co.; 30 cs., Hamburg, H. Kohnstamm Co.; 5 csk. aniline, Hamburg, Irving Bank-Col. Trust Co.

COPRA — 57 bg., Humacao, Franklin Baker Co.; 100 bg., Port Antonio, Atlantic Navigation Corp.; 929 bg., Morant Bay, etc., Franklin Baker Co.

COAL-TAR DISTILLATE—69 dr., Livepool, Monsanto Chemical Works.

DYESTUFFS — 12 bbl., Genoa, Ladenburg, Thalmann & Co.; 24 pkg., Hamburg, Franklin Import & Export Co.

DIVI-DIVI — 350 bg., Monte Cristi, E. Pavenstedt & Co.

EPSOM SALT—300 bg., Hamburg, Superfos Co.

FORMALDEHYDE—80 csk., Rotterdam, Kutroff, Pickhardt & Co.

FUSEL OIL—10 dr., Antwerp, Order; 6 bbl., Dunkirk, Guaranty Trust Co.; 1 dr., Dunkirk, Order.

GLAUBER SALT — 150 bg., Hamburg, Order; 264 csk., Hamburg, Globe Shipping Co.; 399 bbl., Hamburg, A. J. Marcus.

GLYCERINE—47 bbl., Barcelona, Marx & Rawolle; 10 csk., Marseilles, Order.

GUMS—321 bg. copal, Antwerp, Innes & Co.; 500 bg. copal, Antwerp, Equitable Trust Co.; 20 bg. copal, Antwerp, Brown Bros. & Co.; 272 bg. copal, Antwerp, Order; 395 bg. copal, Antwerp, Order; 100 cs. copal and 50 cs. damar, Singapore, Brown Bros. & Co.; 130 bg. copal, Manila, Order; 218 pkg. damar, Singapore, Baring Bros. & Co.; 435 bg. copal and 352 pkg. damar, Singapore, Order.

INDIGO — 6 csk., Rotterdam, Kutroff, Pickhardt & Co.

IRON SILICATE—3 csk., Liverpool, A. Murphy & Co.

IRON OXIDE—40 bg., Leith, Order; 28 csk., Liverpool, Reichard-Coulston, Inc.; 10 csk., Liverpool, J. A. McNulty; 26 csk., Liverpool, E. M. & F. Waldo; 10 csk., Liverpool, J. H. Rhodes & Co.; 127 bbl., Malaga, C. K. Williams & Co.; 278 bbl., Malaga, Hummel & Robinson; 312 bbl., Malaga, C. J. Osborn Co.; 20 bbl., Malaga, Scott L. Libby Corp.; 294 bbl., Malaga, Reichard-Coulston, Inc.; 152 bbl., Malaga, Lee, Smith & Co.; 163 bbl., Malaga, Metor Products Co.; 100 bbl., Marseilles, Order.

LITHOPONE — 1,500 csk., Antwerp, B. Moore & Co.; 400 csk., Antwerp, E. M. & F. Waldo; 300 csk., Antwerp, A. Klipstein & Co.; 60 csk., Bremen, Order.

LOGWOOD EXTRACT — 137 bbl. Cape Haiti, Logwood Mfg. Co.

LAMPBLACK—10 csk., Antwerp, E. Bullock & Sons.

MENTHOL—5 cs., London, Kidder, Peabody & Co.; 5 cs., Antwerp, Baring Bros. & Co.; 20 cs., Antwerp, National City Bank.

MANGANESE — 2 dr. black, London, Austin, Baldwin & Co.

MAGNESITE — 91 bbl., Rotterdam, A. Kramer & Co.; 557 bbl., Rotterdam, Speiden, Whitfield Co.

MANGANESIUM — 250 cs. citrate, Genoa, Order; 716 dr. chloride, Hamburg, Innis, Speiden & Co.; 267 bbl., Hamburg, Speiden, Whitfield & Co.

MAGNETITE ORE — 11,000 tons, Daiquiri, Bethlehem Cuba Iron Mines Co.

MYROBALANS — 8,000 pkt., Calcutta, Order.

NAPHTHALENE — 861 bg., Antwerp, Lloyd Royal Belge.

OCHRE—25 bbl., Malaga, C. J. Osborn Co.; 20 csk., Marseilles, J. Lee Smith & Co.; 19 csk., Marseilles, E. M. & F. Waldo; 224 csk., Marseilles, Reichard-Coulston, Inc.

OILS—Cod—151 csk., St. Johns, R. Badcock & Co. **China Wood**—300 csk., Shanghai, Brown Bros. & Co.; 1,193 csk., Shanghai, Order; 100 dr., Hong Kong, Order; 198 bbl., Hamburg, Order. **Coconut**—627 tons (bulk), Manila, Procter & Gamble Co. **Olive Oil Foots**—200 bbl., Sevilla, Equitable Trust Co.; 200 bbl., Sevilla, Chemical National Bank; 454 bbl., Sevilla, W. Schall & Co.; 250 bbl., Sevilla, Bank of Manhattan Co.; 600 bbl., Sevilla, Order; 100 bbl., Marseilles, Mech. & Metals Nat'l Bank. **Palm**—76 butts and 13 bbl., Sierra Leone, Cie. Franc de l'Afrique Occidentale; 90 csk., Hamburg, African & Eastern Trading Co. **Palm Kernel**—100 bbl., Liverpool, Order. **Rapeseed** — 490 bbl., Liverpool, Vacuum Oil Co.

OIL SEEDS—Castor — 50 bg., Port de Paix, H. Mann & Co. **Linseed**—86,672 bg., Rosario, Anglo-South American Bank; 11,882 bg., Rosario, American Linseed Co.; 8,947 bg., Buenos Aires, L. Dreyfus & Co.; 123,903 bg., Rosario, Order; 109,973 bg., Buenos Aires, American Linseed Co.

PHOSPHATE—1,000 bg., Antwerp, Order; 2,500 bg., Antwerp, Hollingshurst & Co.

POTASSIUM SALTS — 125 bbl. salts, Hamburg, Superfos Co.; 162 dr. caustic, Hamburg, Equitable Trust Co.; 75 dr. caustic, Hamburg, Peters, White & Co.; 250 bbl. chlorate, Antwerp, Order; 7,840 bg. muriate and a quantity of manure salts (amount not specified), Antwerp, Soc. Comm. des Potasses d'Alsace; 15 csk. prussiate, Liverpool, Order; 250 bbl. chlorate, Marseilles, Meteor Products Co.; 375 bbl. do, Marseilles, Order; 50 cs. bromide, Hamburg, National American Bank; 111 dr. caustic, Hamburg, Roessler & Hasslacher Chem. Co.; 4,000 bbl. chlorate, Hamburg, Irving Bank-Col. Trust Co.

QUEBRACHO—8,790 bg., Buenos Aires, International Products Co.

QUININE—100 cs. Rotterdam, American Express Co.

QUICKSILVER—200 flasks, Genoa, Order; 5 flasks Bilboa, Order.

SHELLAC — 150 bg., Calcutta, British Bank of South America; 700 bg., Calcutta, Chase National Bank; 250 bg., Calcutta, Maclac Co.; 325 bg. refuse lac, Calcutta, Bank of the Manhattan Co.; 3,187 bg., Calcutta, Order; 120 bg. garnet, Hamburg, Kasebier-Chatfield Shellac Co.; 19 bg. garnet, Hamburg, Order.

SODIUM SALTS — 200 bbl. hyposulphide, Hamburg, Innis, Speiden & Co.; 305 dr. sulphite, Hamburg, C. S. Grant & Co.; 1,000 bg. nitrate, Antwerp, Order; 168 csk. cyanide, Havre, Asia Banking Corp.; 180 bg. silico fluoride, Rotterdam, Farmers' Loan & Trust Co.; 1,578 csk. hydrosulphite, Rotterdam, Kutroff, Pickhardt & Co.; 1,685 bg. nitrate, Antofagasta, W. R. Grace & Co.; 10,689 bg. nitrate, Iquique, W. R. Grace & Co.; 168 cs. cyanide, Marseilles, Asia Banking Corp.; 131 csk. hyposulphite, Marseilles, Order; 20 csk. perborate, Hamburg, Int'l Acceptance Bank; 125 csk. sulphate, Hamburg, E. M. Sergeant & Co.; 195 dr. sulphate, C. S. Grant & Co.

STARCH—1,200 bg. potato, Rotterdam, Stein, Hall & Co.

TALLOW — 500 pkg. white vegetable, Hankow, American Linseed Co.

TARTRATE LIME—110 csk., Marseilles, Royal Baking Powder Co.; 220 sk., Marseilles, C. Pfizer & Co.

TARTAR—30 csk., Liverpool, Royal Baking Powder Co.; 110 sk., Marseilles, C. Pfizer & Co.; 535 sk., Marseilles, Royal Baking Powder Co.; 108 bg., Bilboa, Order.

ULTRAMARINE—10 csk., Antwerp, Order.

UMBER — 48 csk., Liverpool, L. H. Butcher & Co.

WAXES—250 bg. montan, Hamburg, National City Bank; 48 bg. bees, Rio de Janeiro, London & Brazilian Bank; 50 bg. bees, Rio de Janeiro, Order; 4 csk. bees, Santos, T. Norton & Co.; 19 bg. bees, Buenaventura, Order; 16 bg. bees, Agua, F. Ricart & Co.; 8 cs. do, Santo Domingo City, Curacao Trading Co.; 8 pkg. do, Monte Cristi, Order; 86 bg. bees, Talcahuano, Guaranty Trust Co.; 77 bg. do, Valparaiso, W. R. Grace & Co.; 151 bg. montan, Hamburg, A. J. Marcus.

WOOL GREASE—180 bbl., Antwerp, Order; 5 bbl. Southampton, Order.

ZINC SULPHIDE—2 csk., Southampton, C. A. Sykes.

World's Hog Supply Declines

Numbers of swine in the principal producing countries are estimated at 227,431,000 head by the Department of Agriculture, compared with 263,844,000 head for a representative pre-war year. This is a decrease of 36,413,000 head, or 14 per cent.

The United States shows the largest increase in production. There were 63,424,000 hogs on farms on January 1, 1923, compared with 58,933,000 hogs on farms on January 1, 1914. Smaller increases are indicated for Argentina and Canada.

London Tallow Auction

At the regular weekly tallow auction, held in London August 15, 1,275 casks were offered and 359 sold. Prices realized were unchanged.

The Export of Rubber from Singapore and Penang except upon proof either that the rubber has passed through the customs in British Malaya or that it has been imported from a country outside British Malaya, is prohibited by regulations effective July 1.

The Steamer Salina arrived at San Francisco, Aug. 7, from Manila, with 1700 tons of coconut oil.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0.25 –	$0.25½
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.50
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Acetic, 80%, bbl.	100 lb.	9.58 –	9.83
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.78
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Boric, bbl.	lb.	.10½ –	....
Citric, kegs	lb.	.49 –	.52
Formic, 85%	lb.	.12 –	.14
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.11½ –	.12
22% tech., light, bbl.	lb.	.05½ –	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks,	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½ –	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.12½ –	.12¾
Phosphoric, 50% carboys	lb.	.07½ –	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	11.00 –	12.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	16.00
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.33 –	.34
Tartaric, domestic, bbl.	lb.	.36 –	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.78 –	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.75 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.44 –	...
No. 1, 190 proof, special, dr.	gal.	.38 –	...
No. 1, 188 proof, bbl	gal.	.45 –	...
No. 1, 188 proof, dr	gal.	.39 –	...
No. 5, 188 proof, bbl	gal.	.43 –	...
No. 5, 188 proof, dr	gal	.37 –	...
Alum, ammonia, lump, bbl.	lb.	.03½ –	.03¾
Potash, lump, bbl.	lb.	.03 –	.04½
Chrome, lump, potash, bbl.	lb.	.06 –	.07
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.07 –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½ –	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	4.50 –	4.75
Antimony Sulpuret, golden	lb.	.19 –	.21
Arsenic, white, powd., bbl.	lb.	.10 –	.10½
Arsenic, red, powd., kegs	lb.	.15 –	.15½
Barium carbonate, bbl.	ton	65.00 –	70.00
Barium chloride, bbl.	ton	80.00 –	90.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks	....	.08 –	.08½
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.75 –	....
Spot N. Y. drums	100 lb.	2.00 –	2.20
Borax, bbl.	lb.	.05½ –	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.12 –	.14
Calcium carbide, drums	lb.	.05½ –	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	.06½ –	.07
Camphor, cases	lb.	.86 –	.88
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	.09 –	.09½
Chalk, precip.—domestic, light, bbl.	lb.	.04½ –	.04½
Domestic, heavy, bbl.	lb.	.03½ –	.03¾
Imported, light, bbl.	lb.	.04½ –	.05
Chlorine, liquid, tanks, wks.	lb.	.05½ –	.05½
Cylinders, 100 lb., wks	lb.	.06 –	.06½
Cylinders, 100 lb., spot	lb.	.09 –	....
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks	ton	20.00 –	21.00
Copper carbonate, bbl.	lb.	18 –	.19
Copper cyanide, drums	lb.	.47 –	.50
Coppersulphate, dom., bbl.	100 lb.	5.35 –	...
Imp. bbl.	100 lb.	4.50 –	4.75
Cream of tartar, bbl.	lb.	.24¾ –	.26
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	.90 –	1.00
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 –	2.50
Ether, U.S.P., resale, dr	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.80 –	.81

Ethyl acetate, ether 98% to 100%)	gal.	$0.95 –	$1.00
Formaldehyde, 40%, bbl.	lb.	.14 –	.14½
Fullers earth—imp., powd., net	ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	....	....
Fusel oil, crude, drums	gal.	4.00 –	4.25
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.17 –	.17½
Glycerine, dynamite, drums	lb.	.15½ –	.16½
Glycerine, crude 80%, loose	lb.	.11½ –	....
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½ –	.09½
White, basic sulphate, casks	lb.	.08½ –	.09
White, in oil, kegs	lb.	.11½ –	.11½
Red, dry, casks	lb.	.10½ –	.10½
Red, in oil, kegs	lb.	.13 –	.14½
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl.	lb.	.20 –	.21
Lime-Hydrated, bg, wks.	ton	10.50 –	12.50
Bbl., wks	ton	18.00 –	19.00
Lime, Lump, bbl	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½ –	.10½
Lithophone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07½ –	.07½
Magnesium carb., tech., bags	lb.	.08 –	.08½
Methanol, 95%, bbl.	gal.	1.18 –	1.20
Methanol, 97%, bbl.	gal.	1.20 –	1.22
Methyl-acetone, t'ks.	gal.	1.15 –	....
Nickel salt, double, bbl.	lb.	.10½ –	....
Nickel salts, single, bbl.	lb.	.11½ –	....
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	....	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.10½ –	.10½
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½ –	.06¾
Potassium chlorate, powd.	lb.	.07 –	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08	.08½
Potassium hydroxide (caustic potash) drums	lb.	.07½ –	.09
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06½ –	.07½
Potassium permanganate, drums	lb.	.17½ –	.18
Potassium prussiate, red, casks	lb.	.63 –	.65
Potassium prussiate, yellow, casks	lb.	.33 –	....
Salammoniac, white, gran., casks, imported	lb.	.05½ –	.06
Salammoniac, white, gran., bbl., domestic	lb.	.07½ –	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.45 –	1.50
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.70 –	1.75
Soda ash, dense, bags, contract, basis 58%	100 lb.	1.51 –	....
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums	100 lb.	3.16½ –	....
Soda, caustic, ground and flake, contracts	100 lb.	3.60 –	3.85
Soda, caustic, ground and flake, resale	100 lb.	3.72½ –	.....
Sodium acetate, works, bags	lb.	.05½ –	.05¾
Sodium bicarbonate, bbl.	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.07¾ –	.08
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ –	.04½
Sodium chlorate, kegs	lb.	.06½ –	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22½
Sodium fluoride, bbl.	lb.	$0.08½ –	$0.10½
Sodium hyposulphite, bbl.	lb.	.02½ –	.03
Sodium nitrite, casks	lb.	.07½ –	.07½
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½ –	.04
Sodium prussiate, yel. drums	lb.	.14 –	.14½
Sodium salicylic, drums	lb.	.40 –	.45
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 –	.04
Sodium sulphite, crys., bbl.	lb.	.03½ –	.03¾
Strontium nitrate, powd., bbl.	lb.	.10 –	.11
Sulphur chloride, yel drums	lb.	.04½ –	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Talc—imported, bags	ton	30.00 –	40.00
Talc—domestic powd., bags	ton	18.00 –	25.00
Tin bichloride, bbl.	lb.	.11½ –	.12
Tin oxide, bbl.	lb.	.45 –	....
Tin crystals, bbl.	lb.	.30½ –	.31
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½ –	.06¾
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½ –	......
10 to 35% lead sulphate, bags	lb.	.07 –	......
French, red seal, bags	lb.	.09½ –	......
French, green seal, bags	lb.	.10½ –	......
French, white seal, bbl.	lb.	.12 –	......
Zinc sulphate, bbl.	100 lb.	2.50 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.70
Alpha-naphthol, ref., bbl.	lb.	.68 –	.80
Alpha-naphthylamine, bbl.	lb.	.34 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.75 –	.80
Anthracene, 80%, imp., drums, duty paid	lb.	.65 –	.70
Anthraquinone, 25%, paste, drums	lb.	.80 –	.85
Benzaldehyde U.S.P., carboys	lb.	1.50 –	....
tech, drums	lb	75	....
Benzene, pure, water-white, tanks and drums	gal.	.27 –	.32
Benzene, 90%, tanks & drums	gal.	.25 –	.30
Benzidine base, bbl.	lb.	.80 –	.85
Benzidine sulphate, bbl.	lb.	.70 –	.75
Benzoic acid, U.S.P., kegs	lb.	.75 –	.80
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref., drums	lb.	.45 –	...
Benzyl chloride, tech, drums	lb.	.30 –	.35
Beta-naphthol, tech., bbl.	lb.	.22 –	.23
Beta-naphthylamine, tech.	lb.	.75 –	.80
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, resale, drums	gal.	.85 –	.95
95-97%, drums, resale	gal.	.80 –	.85
Dichlorbenzene, drums	lb.	.06 –	.08
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.40 –	.42
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	07 –	.07¾
Naphthalene, balls, bbl.	lb.	.07½ –	07¾
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½ –	.14½
N-W acid, bbl.	lb.	1.25 –	1.30
Ortho-amidophenol, kegs.	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.15 –	.17
Ortho-nitrophenol, bbl.	lb.	1.20 –	1.30
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.15
Para-amidophenol, base, kegs	lb.	1.35 –	....
Para-amidophenol, HCl, kegs	lb.	1.55 –	....
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitroaniline, bbl.	lb.	.70 –	.74
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.90 –	.95
Phthalic anhydride, bbl.	lb.	.35 –	.38
Phenol, U.S.P., dr.	lb.	.30 –	.35
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	

Pyridine, imp., drums	gal.	$4.25 - $4.50
Resorcinol, tech., kegs	lb.	1.40 - 1.50
Resorcinol, pure, kegs	lb.	2.25 - ....
R-salt, bbl	lb.	.55 - .60
Salicylic acid, tech., bbl	lb.	.32 - ....
Salicylic acid, U.SP., bbl	lb.	.35 - ....
Solvent naptha, water-white, tanks	gal.	.27 - ....
Crude, tanks	gal.	.24 - ....
Sulphanilic acid, crude, bbl	lb.	.18 - .20
Thiocarbanilide, kegs	lb.	.35 - .38
Tolidine, bbl	lb.	1.00 - 1.05
Toluidine, mixed, kegs	lb.	.30 - .35
Toluene, tank cars	gal.	.30 - .32
Toluene, drums	gal.	.34 - .36
Xylidine drums	lb.	.50 - ....
Xylene, pure, drums	gal.	.60 - .65
Xylene, com., drums	gal.	.34 - ....
Xylene, com., tanks	gal.	.29 - ....

Naval Stores

Rosin B-D, bbl	280 lb.	$5.75 - $5.80
Rosin E-I, bbl	280 lb.	5.95 - ....
Rosin K-N, bbl	280 lb.	6.00 - 6.10
Rosin W.G.-W.W., bbl	280 lb.	6.25 - 7.25
Wood rosin, bbl	280 lb.	5.90 - 6.00
Turpentine, spirits of, bbl	gal.	.96 - ....
Wood, steam dist., bbl	gal.	.75 - ....
Wood, dest. dist., bbl	gal.	.60 - ....
Pine tar pitch, bbl	200 lb.	.... - 6.00
Tar, kiln burned, bbl	500 lb.	.... - 12.00
Retort tar, bbl	500 lb.	.... - 11.50
Rosin oil, first run, bbl	gal.	.40 - ....
Rosin oil, second run, bbl	gal.	.45 - ....
Rosin oil, third run, bbl	gal.	.50 - ....
Pine oil, steam dist	gal.	.70 - ....
Pine oil, pure, dest. dist	gal.	.65 - ....
Pine tar oil, ref	gal.	.48 - ....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla	gal.	.32 - .32½
Pine tar oil, double ref., bbl	gal.	.... - .75
Pine tar, ref., thin, bbl	gal.	.... - .25
Pinewood creosote, ref., bbl	gal.	.... - .52

Animal Oils and Fats

Degras, bbl	lb.	$0.04 - $0.04½
Grease yellow, bbl	lb.	.05½ - .06
Lard oil, Extra No. 1, bbl	gal.	.86 - .88
Neatsfootoil 20deg. bbl	gal.	1.28 - 1.30
No. 1, bbl	gal.	.92 - .94
Oleo Stearine		.10 - .10½
Red oil, distilled, d.p. bbl	lb.	.09 - ....
Saponified, bbl	lb.	.09 - ....
Tallow, extra, loose	lb.	.06½ - ....
Tallow oil, acidless, bbl	gal.	.86 - .88

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.13 - ....
Castor oil, No. 1, bbl	lb.	.13½ - ....
Chinawood oil, bbl	lb.	.23 - .23½
Coconut oil, Ceylon, bbl	lb.	.09½ - ....
Ceylon, tanks, N.Y	lb.	.08½ - ....
Coconut oil, Cochin, bbl	lb.	.09½ - .09¾
Corn oil, crude, bbl	lb.	.09½ - ....
Crude, tanks, (f.o.b. mill)	lb.	.07¾ - ....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08½ - .08¾
Summer yellow, bbl	lb.	.11 - ....
Winter yellow, bbl	lb.	.12 - ....
Linseed oil, raw, car lots, bbl.	gal.	.94 - .95
Raw, tank cars (dom.)	gal.	.89 - .90
Boiled, cars, bbl. (dom.)	gal.	.96 - .97
Olive oil, denatured, bbl	gal.	1.10 - 1.12
Sulphur, (foots) bbl	lb.	.08½ - .08¾
Palm, Lagos, casks	lb.	.06½ - .06¾
Niger casks	lb.	.06½ - .06¾
Palm kernel, bbl	lb.	.08½ - .08¾
Peanut oil, crude, tanks (mill)	lb.	.10½ - ....
Peanut oil, refined, bbl	lb.	.13½ - .14
Perilla, bbl	lb.	.15½ - .15½
Rapeseed oil, refined, bbl	gal.	.77 - ....
Rapeseed oil, blown, bbl	gal	.82 - ....
Sesame, bbl	lb.	.11½ - .11½
Soya bean (Manchurian), bbl.	lb.	.10 - ....
Tank, f.o.b. Pacific coast	lb.	.08½ - ....
Tank, (f.o.b. N.Y.)	lb.	.08¾ - .09

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.63 - ....
Menhaden, light pressed, bbl.	gal.	.65 - ....
White bleached, bbl	gal.	.68 - ....
Blown, bbl	gal.	.72 - ....
Crude, tanks (f.o.b. factory)	gal.	.39 - .40
Whale No. 1 crude, tanks, coast	lb.	.... - ....
Winter, natural, bbl	gal.	.76 - .78
Winter, bleached, bbl	gal.	.79 - .80

Oil Cake and Meal

Coconut cake, bags	ton	$26.00 - $28.00
Copra, sun dried, bags, (c.i.f.)	lb.	.04½ - .04¾
Sun dried Pacific coast	lb.	.04½ - .04½
Cottonseed meal, f.o.b. mills	ton	34.00 - ....
Linseed cake, bags	ton	33.00 - ....
Linseed meal, bags	ton	36.00 - ....

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.45 - $0.50
Albumen, egg, tech, kegs	lb.	1.00 - 1.05
Cochineal, bags	lb.	.33 - .35
Cutch, Borneo, bales	lb.	.04½ - .04
Cutch, Rangoon, bales	lb.	.13 - .13½
Dextrine, corn, bags	100 lb.	3.79 - 4.06½
Dextrine, gum, bags	100 lb.	4.14 - 4.34
Divi-divi, bags	ton	38.00 - 39.00
Fustic, sticks	ton	30.00 - 35.00
Fustic, chips, bags	lb.	.04 - .05
Logwood, sticks	ton	26.00 - 30.00
Logwood, chips, bags	lb.	.02½ - .03½
Sumac, leaves, Sicily, bags	ton	78.00 - 80.00
Sumac, ground, bags	ton	$72.00 - $75.00
Sumac, domestic, bags	ton	40.00 - 42.00
Starch, corn, bags	100 lb.	3.22 - 3.49
Tapioca flour, bags	lb.	.07 - .07½

Extracts

Archil, conc., bbl	lb.	$0.18 - $0.22
Chestnut, 25% tannin, tanks	lb.	.02 - .03
Divi-divi, 25% tannin, bbl	lb.	.04 - .05
Fustic, crystals, bbl	lb.	.20 - .22
Fustic, liquid, 42°, bbl	lb.	.08 - .09
Gambier, liq., 25% tannin, bbl.	lb.	.08 - .09
Hematine crys., bbl	lb.	.14 - .18
Hemlock, 25% tannin, bbl	lb.	.03½ - .04
Hypernic, solid, drums	lb.	.24 - .26
Hypernic, liquid, 51°, bbl	lb.	.09½ - .10½
Logwood, crys., bbl	lb.	.17 - .18
Logwood, liq., 51°, bbl	lb.	.08½ - .09
Quebracho, solid, 65% tannin, bbl	lb.	.04½ - .05
Sumac, dom., 51°, bbl	lb.	.06½ - .07½

Dry Colors

Blacks-Carbongas, bags, f.o.b. works, spot	lb.	$0.17 - $0.21
Lampblack, bbl	lb.	.12 - .40
Mineral, bulk	ton	35.00 - 45.00
Blues-Bronze, bbl	lb.	.50 - .55
Prussian, bbl	lb.	.50 - .55
Ultramarine, bbl	lb.	.08 - .35
Browns, Sienna, Ital., bbl	lb.	.06 - .14
Sienna, Domestic, bbl	lb.	.03½ - .04
Umber, Turkey, bbl	lb.	.04 - .04½
Greens-Chrome, C.P.Light, bbl	lb.	.32 - .34
Chrome, commercial, bbl	lb.	.12 - .12½
Paris, bulk	lb.	.28 - .30
Reds, Carmine No. 40, tins	lb.	4.50 - 4.70
Oxide red, casks	lb.	.10 - .14
Para toner, kegs	lb.	1.00 - 1.10
Vermilion, English, bbl	lb.	1.20 - 1.25
Yellow, Chrome, C.P. bbls	lb.	.20 - .21
Ocher, French, casks	lb.	.02½ - .03

Waxes

Bayberry, bbl	lb.	$0.28 - $0.29
Beeswax, crude, bags	lb.	.21½ - .22
Beeswax, refined, light, bags	lb.	.32 - .34
Beeswax, pure white, cases	lb.	.40 - .41
Candelilla, bags	lb.	.20 - .21
Carnauba, No. 1, bags	lb.	.41 - .42
No. 2, North Country, bags	lb.	.23 - .23½
No. 3, North Country, bags	lb.	.17½ - .18½
Japan, cases	lb.	.15½ - .16
Montan, crude, bags	lb.	.04½ - .05
Paraffine, crude, match, 105-110 m.p., bbl	lb.	.04½ - .04¾
Crude, scale 124-126 m.p., bags	lb.	.02½ - .03
Ref., 118-120 m.p., bags	lb.	.03½ - ....
Ref., 125 m.p., bags	lb.	.03½ - ....
Ref., 128-130 m.p., bags	lb.	.03½ - .03¾
Ref., 133-135 m.p., bags	lb.	.04½ - .04¾
Ref., 135-137 m.p., bags	lb.	.05½ - .05½
Stearic acid, sgle pressed, bags	lb.	.12½ - .12½
Double pressed, bags	lb.	.12½ - .13
Triple pressed, bags	lb.	.14½ - .14½

Fertilizers

Ammonium sulphate, bulk, f.o.b. works	100 lb.	$3.20 - $3.25
F.a.s. double bags	100 lb.	3.50 - 3.55
Blood, dried, bulk	unit	4.00 - ....
Bone, raw, 3 and 50, ground	ton	27.00 - 30.00
Fish scrap, dom., dried, wks	unit	3.75 - ....
Nitrate of soda, bags	100 lb.	2.45 - 2.52½
Tankage, high grade, f.o.b. Chicago	unit	3.60 - 3.75
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	$4.00 - $4.50
Tennessee, 78-80%	ton	8.00 - 8.25
Potassium muriate, 80%, bags	ton	34.55 - ....
Potassium sulphate, bags basis 90%	ton	43.67 - ....
Double manure salt	ton	25.72 - ....
Kainit	ton	7.22 - ....

Crude Rubber

Para—Upriver fine	lb.	$0.26½ - ....
Upriver coarse	lb.	.23½ - ....
Upriver caucho ball	lb.	.25½ - ....
Plantation—First latex crepe	lb.	.28½ - ....
Ribbed smoked sheets	lb.	.28½ - ....
Brown crepe, thin, clean	lb.	.27½ - ....
Amber crepe No. 1	lb.	.28 - ....

Gums

Copal, Congo, amber, bags	lb.	$0.12½ - $0.13½
East Indian, bold, bags	lb.	.23 - .23½
Manila, pale, bags	lb.	.20 - .20½
Pontinak, No. 1 bags	lb.	.20 - .20½
Damar, Batavia, cases	lb.	.28 - .28½
Singapore, No. 1, cases	lb.	.32 - .33
Singapore, No. 2, cases	lb.	.23½ - .24
Kauri, No. 1, cases	lb.	.68 - .70
Ordinary chips, cases	lb.	.23 - .24
Manjak, Barbados, bags	lb.	.09 - .09½

Shellac

Shellac, orange fine, bags	lb.	$0.60 - ....
Orange superfine, bags	lb.	.62 - ....
A. C. garnet, bags	lb.	.58 - ....
Bleached, bonedry	lb.	.68 - .70
Bleached, fresh	lb.	.56 - .58
T. N., bags	lb.	.56 - .57

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$500.00 - ....
Asbestos, shingle, f.o.b., Quebec	sh. ton	$65.00 - $85.00
Asbestos, cement, f.o.b., Quebec	sh. ton	10.00 - 14.00
Barytes, grd., white, f.o.b. mills, bbl	net ton	16.00 - 20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 - 15.00
Barytes, floated, f.o.b. St. Louis, bbl	net ton	28.00 - ....
Barytes, crude f.o.b. mines, bulk	net ton	8.00 - 10.00
Casein, bbl., tech	lb.	.14 - .15
China clay (kaolin) crude, f.o.b. Ga	net ton	6.00 - 8.00
Washed, f.o.b. Ga	net ton	8.00 - 9.00
Powd., f.o.b. Ga	net ton	14.00 - 20.00
Crude f.o.b. Va	net ton	6.00 - 8.00
Ground, f.o.b. Va	net ton	13.00 - 19.00
Imp., lump, bulk	net ton	15.00 - 20.00
Imp., powd	net ton	45.00 - 50.00
Feldspar, No. 1 pottery	long ton	7.50 - ....
No. 2 pottery	long ton	6.00 - ....
No. 1 soap	long ton	8.50 - ....
No. 1 Canadian, f.o.b. mill	long ton	18.00 - 20.00
Graphite, Ceylon, lump, first quality, bbl	lb.	.06 - .06½
Ceylon, chip, bbl	lb.	.04½ - .05
High grade amorphous crude	ton	15.00 - 30.00
Gum arabic, amber, sorts, bags	lb.	.15 - .15½
Gum tragacanth, sorts, bags	lb.	.50 - .55
No. 1, bags	lb.	1.50 - 1.60
Kieselguhr, f.o.b. Cal	ton	40.00 - 42.00
F.o.b. N. Y	ton	50.00 - 55.00
Magnesite, crude, f.o.b. Cal	ton	14.00 - 15.00
Pumice stone, imp., casks	lb.	.03 - .05½
Dom., lump, bbl	lb.	.05 - .05½
Dom., ground, bbl	lb.	.05½ - .06
Silica, glass sand, f.o.b. Ind	ton	2.00 - 2.50
Silica, sand blast, f.o.b. Ind	ton	2.50 - 5.00
Silica, amorphous, 250-mesh, f.o.b. Ill	ton	17.00 - 17.50
Silica, glass sand, f.o.b. Ill	ton	1.50 - 3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 - 8.00
Talc, 200 mesh, f.o.b., Vt., bags	ton	6.50 - 9.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 - 9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags	ton	18.00 - 20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75 - ......
Corning	bbl.	1.60 - ......
Cabell	bbl.	1.50 - ......
Somerset	bbl.	1.40 - ......
Illinois	bbl.	1.67 - ......
Indiana	bbl.	1.68 - ......
Kansas and Oklahoma, 28 deg.	bbl.	1.20 - ......
California, 35 deg. and up	bbl.	.83 - ......

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.19½ - ......
Naphtha, V. M. & P. deod, steel bbls	gal	.18½ - ......
Kerosene, ref. tank wagon	gal.	.14 - ......
Bulk, W. W. export	gal.	.06½ - ......
Lubricating oils:		
Cylinder, Penn., dark	gal.	.20 - .22
Bloomless, 30@31 grav	gal.	.18½ - .20½
Paraffin, pale	gal.	.26 - .27
Spindle, 200, pale	gal.	.20 - .21
Petrolatum, amber, bbls	lb.	.05 - .05½
Paraffine wax (see waxes)		

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140-145
Chrome brick, f.o.b. Eastern shipping points	ton	50-52
Chrome cement, 40-50% Cr_2O_3	ton	23-27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks	1,000	45-47
2nd. quality, 9-in. shapes, f.o.b. wks	1,000	41-43
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65-68
9-in. arches, wedges and keys	ton	80-85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	53-55
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	53-55
F.o.b. Mt. Union, Pa	1,000	45-47
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y	ton	$200.00 - $225.00
Ferrochromium, per lb. of Cr, 6-8% C	lb.	.07 - .08
4-6% C	lb.	.10 - .12
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	117.50 - ....
Spiegeleisen, 19-21% Mn	gr. ton	45.00 - 47.00
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	2.00 - 2.50
Ferrosilicon, 10-15%	gr. ton	43.00 - 50.00
50%	gr. ton	77.50 - ....
75%	gr. ton	135.00 - 155.00

Ferrotungsten, 70-80%, per lb. of W	lb.	\$0.85 -	\$0.95
Ferro-uranium, 35-50% of U. per lb. of U	lb.	3.50 -	4.50
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 -	4.50

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	\$5.50 -	\$8.75
Chrome ore Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 -	23.00
C.i.f. Atlantic seaboard	ton	21.00 -	25.00
Coke, fdry., f.o.b. ovens	ton	5.25 -	5.75
Coke, furnace, f.o.b. ovens	ton	4.25 -	4.75
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 -	.....
Ilmenite, 52% TiO_2	lb.	.01½-	.01¾
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.35 -	....
Manganese ore, chemica (MnO_2)	ton	80.00 -	85.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 -	.70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 -	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½-	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½-	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12	
Rutile, 95% TiO_2	lb.	.12 -	....
Tungsten, scheelite, 60% WO_3 and over	unit	8.75 -	9.00
Tungsten, wolframite, 60% WO_3	unit	8.50 -	8.75
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 -	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 -	2.50
Vanadium pentoxide, 99%	lb.	12.00 -	14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 -	1.00
Zircon, washed, iron free, f.o.b. Pablo, Fla.	lb.	.02 -	.10

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	13¾-14
Aluminum, 98 to 99%	26-27½
Antimony, wholesale, Chinese and Japanese	7½-8
Nickel, virgin metal	27-29
Nickel, ingot and shot	30-32
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	39.25
Lead, New York, spot	6.50
Lead, E. St. Louis, spot	6.35
Zinc, spot, New York	6.70
Zinc, spot, E. St. Louis	6.35

Other Metals

Silver (commercial)	oz.	\$0.63
Cadmium	lb.	1.00
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25-.....
Platinum	oz.	116.00
Iridium	oz.	275.00@300.00
Palladium	oz.	80.00
Mercury	75 lb.	65.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	22.50
Copper bottoms	31.50
Copper rods	23.00
High brass wire	20.25
High brass rods	18.00
Low brass wire	21.75
Low brass rods	22.00
Brazed brass tubing	24.25
Brazed bronze tubing	28.50
Seamless copper tubing	27.00
Seamless high brass tubing	25.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	9.25@9.50
Copper, heavy and wire	11.25@11.50
Copper, light and bottoms	10.25@10.50
Lead, heavy	5.25@5.50
Lead, tea	3.25@3.37½
Brass, heavy	6.25@6.50
Brass, light	5.25@5.50
No. 1 yellow brass turnings	6.00@6.25
Zinc scrap	3.50@3.75

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	\$3.64	\$3.64
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Arizona

PHOENIX—The Western Cotton Oil Co. has completed plans for the erection of a new mill on 7th St. near the line of the Arizona Eastern Railway, to cost about \$100,000, with machinery. E. A. McDonald is general manager.

California

SACRAMENTO—R. C. Demarest, head of the Hicks Iron Works, 967 Howard St., San Francisco, is perfecting plans for the erection of an experimental iron-smelting plant on local site, to operate under the Driscoll process, utilizing non-coking fuel. The furnace will be of 10 tons capacity and with auxiliary plant equipment will cost approximately \$80,000. Upon the successful consummation of the project, it is purposed to organize a company and build a large plant of the same character on the site, to cost in excess of \$2,000,000.

TORRANCE—C. C. Julian, operating oil properties, has acquired a tract of 230 acres of land in the Dominguez section as a site for a new oil-refining plant, for which plans will be prepared at an early date. It will cost in excess of \$150,000.

SAN FRANCISCO—The Great Western Smelting & Refining Co., 75 Folsom St., will soon take bids for the erection of a new 1-story foundry, 137x275 ft., at Spear and Folsom Sts., estimated to cost \$75,000. Morrow & Garren, Chronicle Bldg., are architects.

Georgia

AINSLIE—The Southeastern Portland Cement Co., Hotel Dempsey, Macon, Ga., recently organized with a capital of \$3,000,000, will soon commence the construction of its proposed local cement-manufacturing plant, on 600-acre tract, lately acquired. Equipment bids will also be asked at the same time. The plant will have an output of about 3 000 bbl. per day, and is estimated to cost \$2,000,000, with machinery. G. P. Dieckman is vice-president and general manager; J. E. Satterfield is secretary and treasurer.

Illinois

CHICAGO—The Chicago Varnish Tile Co. has acquired the property of the Superior Oven Co., 5701 West 66th St., Clearing Industrial District, totaling about 15,000 sq.ft. of floor space, and will occupy the buildings for a new plant for the manufacture of tile specialties. Plans are under way for the construction of an addition to double, approximately, the present capacity. Stewart Waring is president.

SPRINGFIELD—The Department of Public Works and Buildings, C. A. Miller, director, has tentative plans under consideration for the construction of a new state-owned cement mill on site to be selected, estimated to cost in excess of \$3,500 000. Edgar A. Martin, 304 South Wabash Ave., Chicago, is architect.

Indiana

RICHMOND—The Fibre Conduit Co., Orangeburg, N. Y., has excavations in progress for the erection of the first unit of its new local plant on tract recently acquired, to consist of several buildings, estimated to cost \$400,000, with equipment. A general contract for the structures has been awarded to the John Mueller Co., Palladium Bldg., Richmond. S. R. Bradley is president.

ANDERSON—Fire, Aug. 2, destroyed a portion of the plant of the International Rubber Co., manufacturer of inner tubes, etc., with loss estimated at \$18 000. It is planned to rebuild. H. W. Lantz is one of the heads of the company.

MUNCIE—The Muncie Malleable Foundry Co. will soon take bids for the erection of a 1-story addition on Highland Ave., 70x110 ft., to be equipped as a molding department, estimated to cost \$25,000.

Kansas

BONNER SPRINGS—The Kansas Portland Cement Co., Federal Reserve Bank Bldg., Kansas City, Mo., will soon break ground for the erection of the initial buildings of its proposed local mill, estimated to cost approximately \$1,000,000, with machinery. It is expected to have the plant ready for service early in the spring.

Kentucky

LOUISVILLE—The Van Camp Packing Co., Indianapolis, Ind., will commence foundations for a 3-story and basement oil-refining plant, 85x120 ft., on local site estimated to cost \$150,000, with equipment. F. Erhart, Norton Bldg., Louisville, is architect.

Louisiana

MONROE—The Acme Carbon Mfg. Co., recently organized with a capital of \$250,000, is perfecting plans for the erection of a new local plant, consisting of several buildings, estimated to cost about \$125,000 with equipment. It is expected to call for bids early in the fall. L. N. Larche heads the company.

Michigan

GRAND RAPIDS—The Keeler Brass Co., 947 Godfrey Ave., is considering tentative plans for the erection of a new 1-story addition. M. S. Keeler is president.

OAKWOOD—The Detroit Steel Corp. has filed plans for the construction of a 1-story building at its new local works, estimated to cost \$175,000, for which a general contract has been let to Bonnah & Chaffee, Farwell Bldg., Detroit.

Montana

BUTTE—The Butte Refining Co. has purchased property in the southwestern section of the city and plans for the construction of a new oil and gasoline refining plant, with initial daily output of about 500 bbl.

MISSOULA—The Utah-Idaho Sugar Co., Salt Lake City Utah, is said to be considering plans for the construction of a new mill in western Montana, vicinity of Missoula, to be operated in conjunction with its other mills in Idaho, Utah and Washington.

New Jersey

TRENTON—The Van Pottery Co., Parker Ave., has taken out a permit for the erection of a new 2½-story addition to its plant, to be used for the manufacture of general ware.

LINDEN—The Standard Oil Co. of New Jersey, 26 Broadway, New York, N. Y., has plans in preparation for the construction of a new works and refinery at Linden, consisting of 1, 2 and 3 story buildings, estimated to cost \$300,000, with equipment. Bids will be asked early in the fall.

New York

TOTTENVILLE, S. I.—The Atlantic Industrial Alcohol Co. has plans for the construction of a new plant on property recently acquired on the Arthur Kill Road, near Kreischerville, with frontage on Staten Island Sound. It will consist of three main buildings, 80x350 ft., 80x240 ft. and 80x160 ft., respectively, with large tankage department. It will be equipped for an initial production of 100 bbl. per day, to be increased to 250 bbl. in the near future. Floyd S. Corbin, 300 Madison Ave., New York, is interested in the company.

NEW YORK—The Union Carbide & Carbon Co., 30 East 42nd St., will make extensions and improvements in its plants and subsidiary organization works in various parts of the country during the present year, to cost in excess of \$5,000,000. The Linde Air Products division has work in progress on a new branch plant at Tulsa, Okla., for the manufacture of industrial oxygen, etc., to cost about \$250,000; other units will be constructed later.

Ohio

CANTON—The Bahl-Shem China Co. has been organized to take over and operate a local pottery heretofore conducted by John L. Bahl and William E. Shem, both of whom will head the new organization. Extensions are planned.

Oklahoma

FAIRFAX—The Common Council has preliminary plans under consideration for the construction of a municipal gas plant, estimated to cost about $30,000, in which amount bonds have been voted.

Oregon

OREGON CITY—The Hawley Pulp & Paper Co. will soon commence the construction of a new 3-story mill to replace the present Mill B, on Main St., including the installation of equipment for considerable increase in capacity. A new power house will also be built.

Pennsylvania

LANCASTER—The Hydro-Carbon Chemical Co. has preliminary plans for the rebuilding of the portion of its local plant, destroyed by fire, Aug. 8, with loss estimated at $18,000.

PHILADELPHIA—The Atlantic Refining Co., 3144 Passyunk Ave., manufacturer of refined oils, has filed plans for the erection of a new building at Wolf and 36th Sts., estimated to cost $40,000.

MARCUS HOOK—Fire, Aug. 5, destroyed a portion of the local storage and distributing plant of the Standard Oil Co., with loss estimated at $80,000. It will be rebuilt.

PHILADELPHIA—C. F. Rumpp & Sons, Inc., 114-20 North 5th St., manufacturer of leather products, has filed plans for the erection of a 1-story addition to its plant to cost about $12,000.

South Carolina

CHARLESTON—The Logan-Robinson Fertilizer Co., 26 Broad St., recently formed with a capital of $100,000, has acquired a local building and will install equipment for a new plant to develop an initial output of about 950 tons per month. W. H. Logan is treasurer.

Tennessee

CHATTANOOGA—The Scholze Soap & Fertilizer Co., Middle St. and St. Elmo Ave., is planning for the erection of an addition to its plant, estimated to cost about $50,000, with equipment.

Texas

WICHITA FALLS—The Constantin Refining Co., Tulsa, Okla., has purchased property at Megargel, near Wichita Falls, as a site for a new oil-refining plant with initial output of 1,000 bbl. The company has formed the Megargle Oil & Refining Co., with capital of $200,000, as a subsidiary organization to carry out the project. E. Constantin, Jr., is one of the heads of the new company.

ORANGE—The Texas Creosoting Co., recently organized with a capital of $450,000, has plans for the erection of a new local plant for the treatment of ties and other lumber products, consisting of two main operating units, estimated to cost $175,000. R. S. Manley is president and general manager.

LULING—The Magnolia Petroleum Co., Dallas, Tex., has tentative plans for construction of a new oil-refining plant on site acquired near Luling. Size of buildings and capacity will be determined at an early date.

DALLAS—The Globe Drilling & Rock Island Refining Co., lately organized with a capital of $100,000, has plans nearing completion for the construction of a new gasoline refinery on site selected. L. B. Simmons, Duncan, Okla., is engineer. C. H. Verschoyle is president.

West Virginia

CLARKSBURG—The American Sheet Glass Co. lately organized, is perfecting plans for the installation of machinery at the former plant of the Liberty Glass Co., Northview, near Clarksburg, to cost in excess of $100,000. The company has increased its capital from $250,000 to $350,000, to provide for the project. H. E. Travis and Paul M. Robinson are heads.

Wisconsin

MILWAUKEE—The Pittsburgh Plate Glass Co., Frick Bldg., Pittsburgh, Pa., has arranged an appropriation of $5,000,000 for extensions in the plant of its Patton Paint Co. division, during the next 24 to 36 months. A large tract of land has been purchased at Florida and South Water Sts., for the new plant units. A large chemical experimental department will be installed. Work will commence at once on a power plant to cost $500,000.

New Companies

INDUSTRIAL CHEMICAL CORP., Los Angeles, Calif.; chemicals and chemical byproducts; $50,000. Incorporators: Elbert M. Vail, Henry R. Vail and Clark E. Bell. Representative: Dwight D. Bell, Spreckels Bldg., San Diego, Cal.

GEORGE A. KIM GLASS Co., Pittsburgh, Pa.; glass products; $200,000. H. S. McCune, Wilkinsburg, Pa., is treasurer and representative.

ST. LOUIS RUBBER CEMENT Co., St. Louis, Mo.; organized; cements, glues etc. Incorporators: H. L. Hadley and Julius Merz, both of St. Louis.

ATLAS STEEL WORKS, INC., Camden, N. J.; steel products; $125,000. Incorporators: Daniel M. Loh, Russell H. Post and Paul R. Sander, 623 Pearl St., Camden. The last noted is representative.

WILSON OIL CORP., New York N. Y.; oil products; $100,000. Incorporators: F. Taylor and M. C. Wilson. Representative: W. H. Wilson, 32 Broadway, New York.

BLUE RIBBON CHEMICAL Co., 2052 North Halsted St., Chicago, Ill.; chemicals and chemical byproducts; $20,000. Incorporators: Henry C. Nichols, Ludwig Hohmeyer and William Stamnick.

ELK RIVER CLAY PRODUCTS CORP., 1137 Calvert Bldg., Baltimore, Md.; tile and other burned clay products; $300,000. Incorporators: John V. Pimm and Francis L. Schmid.

ANOLU PETROLEUM CORP., Blackwell, Okla.; refined oil products; $500,000. Incorporators: C. M. McConnell, O. H. Borst, Blackwell; and Ray Otstot, Enid, Okla. Representative: Colonial Charter Co., Ford Bldg., Wilmington, Del.

OREGON ALUMINUM MFG. Co., Portland, Ore.; aluminum and other metals; $10,000. Roy H. Mollett is the principal incorporator. Representative: Robert N. Munly, 82 West Park St., Portland.

BEAUMONT CHEMICAL Co., 4641 Kenmore Ave., Chicago, Ill.; chemicals and chemical byproducts; $5,000. Incorporators: C. B. and Jean Beaumont, and John R. Haas.

TICE-TINSLEY STEEL Co., Youngstown, O.; steel products; $50,000. Incorporators: E. M. and Charles A. Tice, both of Youngstown.

VICTOR PRODUCTS Co., 120 Green St., Newark, N. J.; organized; polishing oils, etc. Maurice D. Marcuse heads the company.

WEST VIRGINIA MATCH Co., Wheeling, W. Va.; to construct and operate a local plant for the manufacture of matches; $300,000. Incorporators: E. L. Yeager and Otto Schenk, both of Wheeling.

PYRAMID PORTLAND CEMENT Co., Des Moines, Ia.; construct and operate a cement mill; $100,000. Incorporators: A. C. Pearsall, A. O. Hauge and F. H. Mackmal. Representative: Corporation Service Co., Equitable Bldg., Wilmington, Del.

KEATES CHEMICAL PRODUCTS CORP., New York, N. Y.; chemicals and chemical byproducts; $25,000. Incorporators: W. F. Keates, A. G. Fontana, and M. E. Crosby. Representative: J. T. Weed, 80 William St., New York.

FERROMANGANESE Co., San Francisco, Calif.; ferromanganese and other metals; $200,000. Incorporators: Morse Erskine and E. Clarkson. Representative: Key & Erskine, Humboldt Bank Bldg., San Francisco.

DIAMOND PAINT CLEANER Co., Cincinnati, O.; chemical products; $100,000. Incorporators: Don C. Smith and Emil N. Schlesinger, both of Cincinnati.

NORTH STAR STRAWBOARD MILLS, INC., 831 South Front St., Quincy, Ill.; paperboard and composition products; $250,000. Incorporators: A. W. D. Weis, J. Paul Brady and Edward P. Lannan.

G & G PRODUCTS Co., Tarrytown, N. Y.; chemical products; organized. David Gordon and Harry Goldberg, both of Tarrytown, N. Y.

MAXUDIAN PETROLEUM CORP., New York, N. Y.; refined oil products; $5,000,000. Representative: Registrar & Transfer Co., 900 Market St., Wilmington, Del.

CHARLES S. AYRES, INC., Camden, N. J.; paper products; $125,000. Incorporators: Philip H. Weber, David L. Vaughan and Charles S. Ayres, 106 Market St., Camden. The last noted is representative.

SOLAR PRODUCTS Co., 124 West Lake St., Chicago, Ill.; soaps, cleansers, etc.; 50 shares of stock, no par value. Incorporators: John D. Peterson, Walter H. Eckert and L. L. Harris.

UNION CREOSOTE & OIL Co., INC., New York, N. Y.; oils and kindred products; $150,000. Incorporators: J. M. and M. Kornfeld, and H. Bargebuhr. Representative: McKinstry & Kornfeld, 198 Broadway, New York.

Industrial Notes

THE POWER SPECIALTY Co., New York, announces that after Oct. 1 the Philadelphia office will be located in the Atlantic Bldg., at Broad and Spruce Sts.

THE SHEPHERD CHEMICAL Co., Cincinnati, O., manufacturer of cobalt driers, will hereafter be represented by Alex C. Ferguson, Jr., Drexel Bldg., Philadelphia, as sales agent for Pennsylvania, Delaware, Maryland and New Jersey outside of the New York district.

THE OILGEAR Co. of Milwaukee has recently moved its office and factory into larger quarters at 398-406 Thirty-Eighth St.

THE CALORIZING Co., of Pittsburgh has recently engaged James A. Stairs to assist in development of the Calorized tube recuperators which the company is putting on the market. Mr. Stairs has been in the steel and engineering business for more than 20 years.

THE DIAMOND POWER SPECIALTY CORP., of Detroit, has announced the appointment of Paul E. Theis as sales manager of the Cleveland district, with offices at 608 Rockefeller Bldg. It is also announced that the Boiler Equipment Service Co., Candler Bldg., Atlanta, Ga., is now selling Diamond soot blowers in the states of Georgia and Florida, having been appointed district representative by the Diamond Power Specialty Co.

THE SUCHAR PROCESS CORP., 200 Fifth Ave., New York City, has been appointed sole distributor of the Industrial Chemical Co.'s new carbon—Suchar—for application to sugar and sirups. The Suchar Process Corp. is represented by a group of experienced technical men familiar with all phases of the sugar and sirup refining industry, and is prepared to undertake building of plants and installation of refining processes applicable to all branches of the sugar, sirup and molasses industries. The president of the company is John J. Naugle.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

BICHROMATE OF POTASH. Rio de Janeiro, Brazil. Agency.—7475.

CHEMICALS, HEAVY. Including caustic soda, bichromate of soda and potash. Milan, Italy. Agency.—7465.

CHEMICALS, HEAVY. Latin America. Agency.—7453.

COLORS AND OILS. Montevideo, Uruguay. Purchase and Agency.—7432.

DISINFECTANTS, CATTLE. Havana, Cuba. Agency.—7480.

ANILINE DYES. Latin America. Agency. —7453.

NAVAL STORES. Milan, Italy. Agency.—7465.

PITCH COAL TAR, naphthalene, aniline oil. Lyon, France. Purchase.—7471.

POTASSIUM AND SODA BICHROMATES, and carbon-gas blacks. Liége, Belgium. Agency.—7483.

ROSIN. Rio de Janeiro, Brazil. Agency. —7475.

SODA caustic, silicate of soda and bichromate of soda. Rio de Janeiro, Brazil. Agency.—7475.